# Popular Mechanics

*"Written So You Can Understand It."*
*"Tells You How to Do Things."*

VOL. V. **Contents for September** NO. 1

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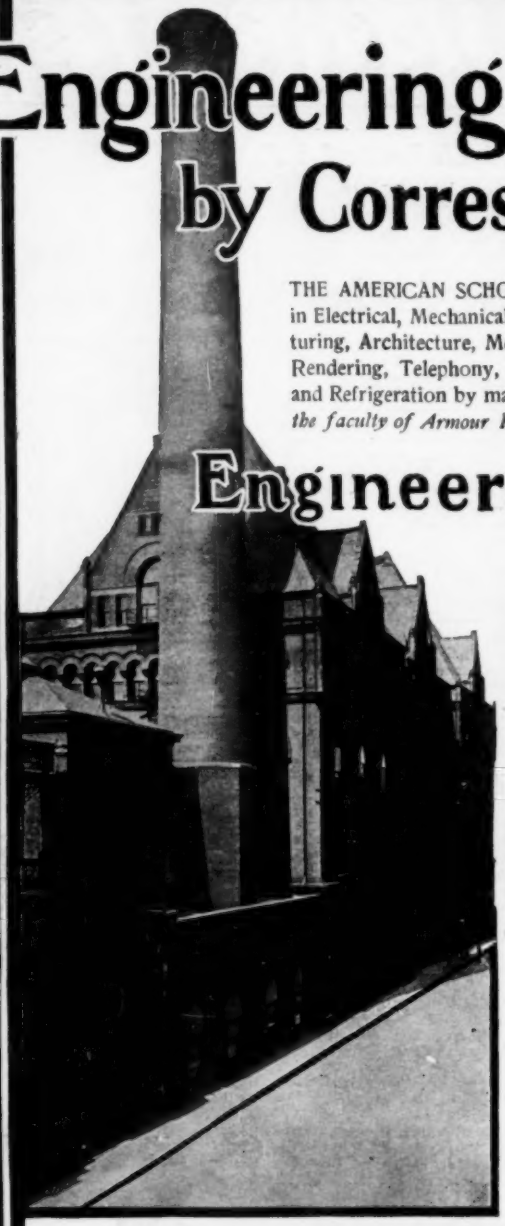

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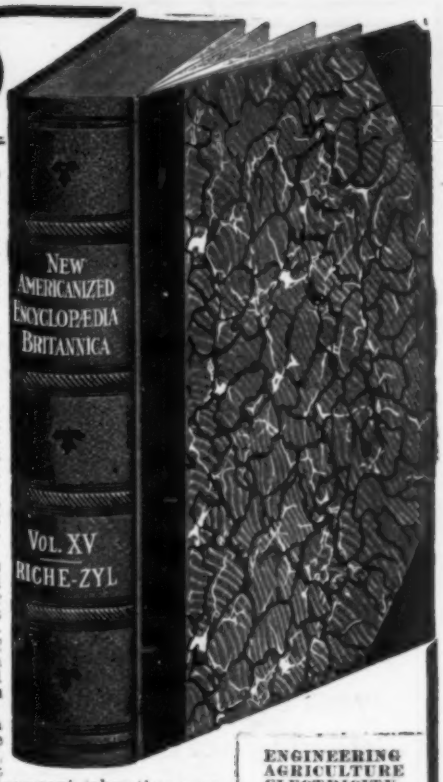


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# Announcement

With this issue Popular Mechanics changes from a 16-page weekly to a 100-page monthly in magazine form. The original Popular Mechanics idea, of an illustrated review of the mechanical and engineering press of the world "written so you can understand it," will not be changed. We shall continue to tell about all the great events that are transpiring throughout the world in the same unique, interesting and instructive style which made the weekly edition so popular.

The new form and increased number of reading pages will enable us to print complete articles which heretofore were continued through several issues, and new features will constantly be added.

To the busy professional and business men Popular Mechanics brings that general knowledge of mechanical progress which every one desires in this "age of mechanics." To the manufacturer and mechanic who wish to go into more minute details of any special subject it tells where such information may be found.

**SIGNOR GUGLIELMO MARCONI**
Founder and Inventor of Marconi Wireless Telegraph System

# Wireless Messages to Fill the Air

## Marconi Stations Being Established With Remarkable Rapidity in all Parts of the World

How long will it be before the air is full of words flitting across continents and oceans, conveying messages of cheer and sorrow, hope and despondency? Already thousands of those strange invisible messages are flying about over many of our heads, speeding along with lightning swiftness without the aid of wires or other material agency. And now wireless telegraph stations are going up in all parts of the world in such numbers as to show that a new era of intercourse is upon us. With such marvelous rapidity is the new discovery being developed through the genius of Guglielmo Marconi that the question at once arises in our minds: Will this wizard of the air cause the total abandonment of wires as mediums for the transmissions of messages? Will we be able to talk with any one we please in our home city or across the seas by merely building a little attachment to our roofs, in appearance not unlike the old-fashioned lightning rods? It seems like building air castles to hope for such, but this man Marconi has already built air telegraph lines, and we have found that they perform the same functions as wire telegraph lines, so he has started us to wondering what his magic will accomplish for us before his powers have vanished.

Such a little while ago the world read of Marconi's intention of sending a message across the ocean without wires and laughed at him as a crank; such a little while ago we read of his having succeeded in transmitting a vague wireless telegram from Grace Bay, Nova Scotia, to Poldhu, England, and were amazed and still doubted, for the feat seemed contrary to the laws of nature. Then followed fast and faster news of clear, distinct messages, of nations' rulers exchanging greetings across the seas, of messages being sent to and from ships at sea, of the establishment of wireless instruments on all the leading ocean steamship lines, and of newspapers with wireless telegraph news being printed on ocean liners. Now each nation seems to vie with

TRANSATLANTIC HIGH POWER MARCONI STATION AT GLACE BAY, NOVA SCOTIA.

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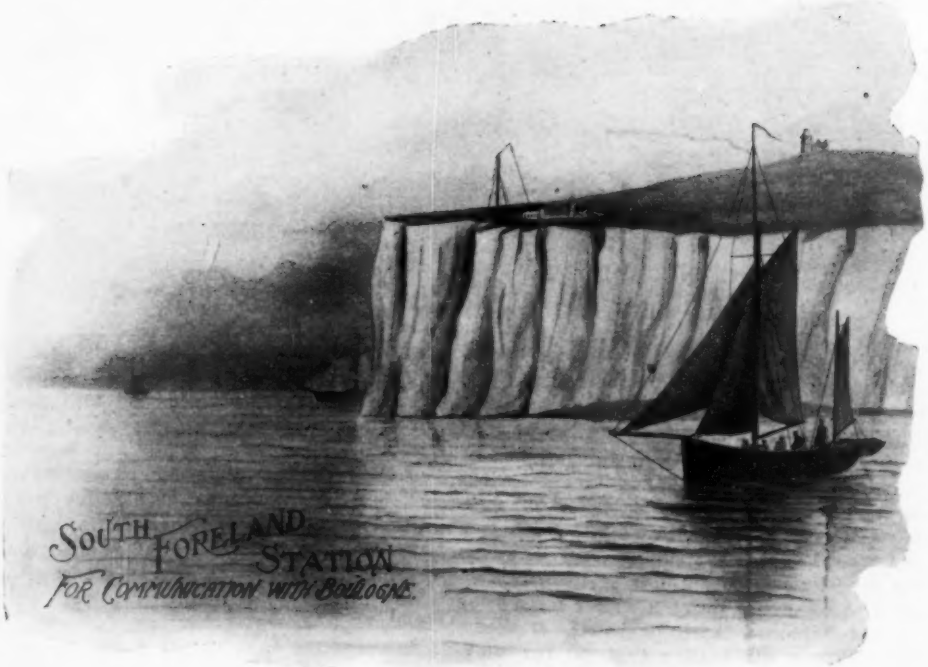
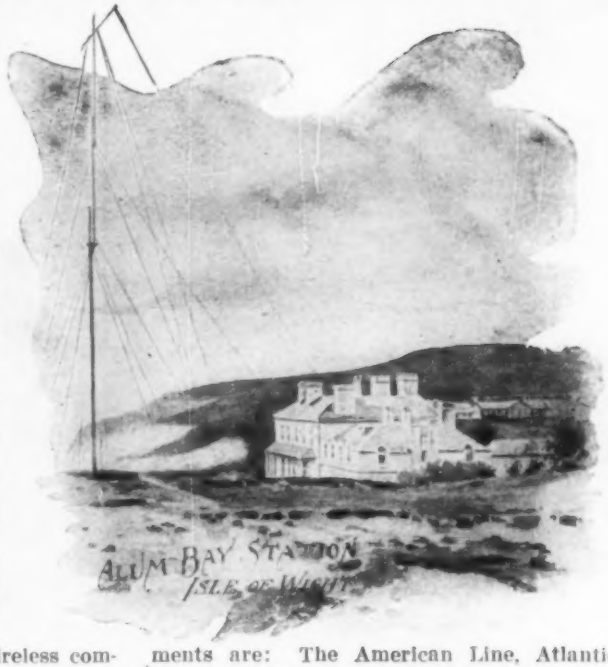
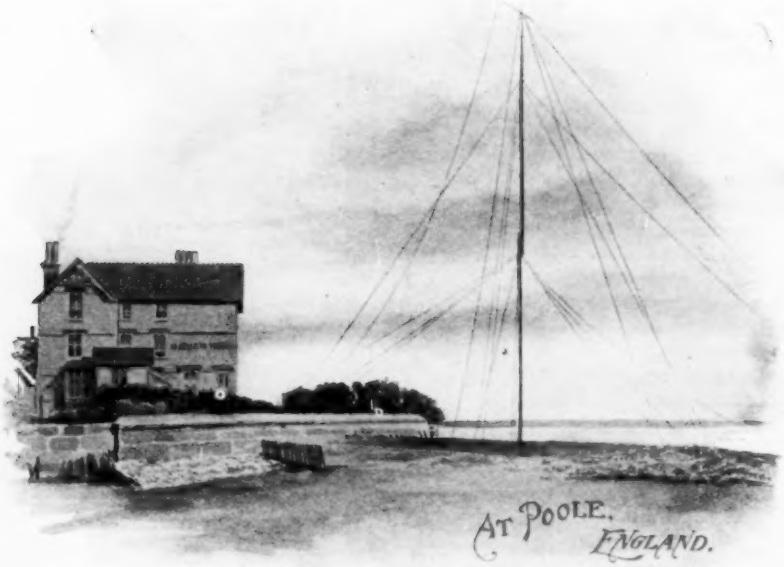
NORTH FORELAND.
CALVI, CORSICA.


SOUTH FORELAND STATION
FOR COMMUNICATION WITH BOULOGNE.

the other in the establishment of Marconi wireless telegraph stations. Wireless messages have been exchanged between trains and sent from city to city throughout the country. The day-by-day transmission of news between the new and the old worlds from New York to London has been undertaken by the London Times. The Postal Telegraph-Cable Company has made formal announcement of its entering into a co-operative agreement with the Marconi Company for sending messages to vessels at sea. Lloyds have formally adopted the Marconi system for communication between ships and shore. The English admiralty has land stations at Malta, Gibraltar, Tien Tsin, Hong Kong, Bermuda and thirty-two men of war equipped with the apparatus. Five stations and twenty ships of the Italian navy have been equipped for wireless communication. Among the steamer lines that have been equipped with wireless instruments are: The American Line, Atlantic Transport Line, Cunard Line, North German Lloyd, French Line, Beaver Line and the Allan Line.

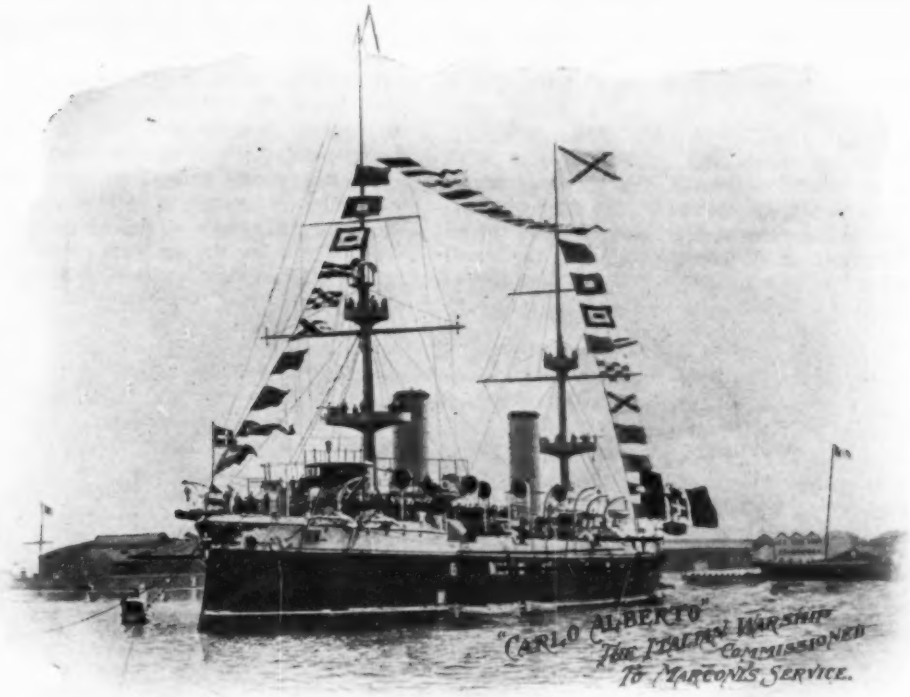


That America is not to be last in taking advantage of this wonderful new discovery is shown by recent active operations of American citizens and the American government. The Marconi Wireless Telegraph Company of America has been organized with a capital stock of $6,650,000, and Munroe & Munroe, of New York, Montreal and Chicago, have become its official agents, as well as of the Marconi Wireless Telegraph Company of Canada, which has been incorporated with a capital stock of $5,000,000. The United States government has just built five wireless telegraph stations in Hawaii and two of the most modern type in Cuba. Three improved Marconi stations are now being installed by the United States government in Alaska. Stations are to be established all along the Pacific coast and in the Philippines. Other stations al-



AT POOLE, ENGLAND.

INTERIOR OF STATION AT POOLE.



"CARLO ALBERTO" THE ITALIAN WARSHIP COMMISSIONED TO MARCONI'S SERVICE.

MARCONI SCHOOL AT FUNTON-ON-SEA

ready in operation are: Nantucket lightship (Herald Station), Siasconset, Sagaponack, Babylon and Cape Cod. It is the intention of the United States government to place all the new insular possessions in communication with each other and with the government at Washington by means of the Marconi system. Government stations will also be established at different points on the great lakes and on the eastern and southern shores as well as on the Pacific coast.

England has wireless stations at Withernsea, Caistor, Fritton, Chelmsford, North Foreland, Dunge Ness, New Haven, Portsmouth, Culver Cliff, Niton, Poole, Portland, Lizard, Scillies, Poldhu, Crookhaven, Queenstown, Rowlare, Hollyhead, Inishtrahul and other places. Germany has Marconi stations at Borkum Island and on Borkum lightship. Belgium has a station at La Panne. Several stations have been built in South Africa.

Never before has a discovery so radically new made such progress as has wireless telegraphy. It was a quarter of a century from the time the principle of the telephone was known until it was in commercial operation. It required even longer to get the telegraph into practical operation. It will be less than five years from the time Marconi made known his discovery to the world that wireless telegraphy will be a commercial institution of the civilized world.

## TRAIN ACROSS CONTINENT BREAKS ALL RECORDS.

In his vain race with death to reach the bedside of his daughter before she died, Henry P. Lowe, chief engineer of the United States Steel Corporation, broke all records of trips across the continent. His special train made the run from Chicago to Los Angeles, 2,256 miles, in 53 hours. This is nearly five hours better than the best previous record. Mr. Lowe's train made an average speed of 42 miles an hour, including all stops.

The total distance traveled by Mr. Lowe from New York to Los Angeles was 3,230 miles. The running time consumed, including all stops, was 70 hours and 40 minutes, or one hour and twenty minutes less than three days.

The British Monitor Scorpion sank near Boston recently while on a passage from Bermuda to St. Johns, N. B., where she was to be broken up by a Boston firm.

## THE FRONT COVER ILLUSTRATION.

Stanley Spencer, the great English aeronaut, whose feat of steering his baloon over the city of London was chronicled by the newspapers throughout the world a short time ago, expects to perform even more remarkable achievements in the near future. He has built a new airship, with which he expects to solve the problem of aerial navigation. The front page illustration shows the new ship as it is about to be launched on an experimental trip. The official test of the craft will probably be made in a few months. In the trip over London Spencer sailed his former airship thirty miles in one hour and forty-five minutes, altering his course at will and sailing well against the wind.

## NEW SYSTEM FOR DRYING FIRE HOSE.

A new hose drier which will hold 600 feet at one time and dry the hose in half the time has been devised. The Fireman's Herald says the contrivance consists of a handsome case or box, ornamented and panelled, fifty feet in length (the length of a section of hose), with a fan or blower attached to a funnel at one end; the blower being propelled by a motor, electric, gasoline or water, which drives a strong current of air through the box, which, passing over the hose, absorbs and evaporates all moist- one foot. Even should the current pass a few hours.

The box is but twenty-two inches wide and twenty-five inches high, and can easily be placed on the floor along the wall of an ordinary engine house, and may be conveniently used as a bench or seat. The hose can readily be taken directly from the reel and placed into the box, and removed when dry and replaced upon the reel by one man.

There is no strain upon the hose while in the box; it resting upon galvanized iron bars which fit lightly into sockets at the side of the box and are easily removable, and which have depressions to prevent the several sections of hose from rolling together and coming in contact with the box. The ends of the hose are held in place by steel springs instead of couplings.

It is estimated that the steel mills of the United States will fall short 200,000 tons of being able to fill their orders for steel rails for the year, which orders called for 3,000,000 tons.

# Pope's Body Suspended in Midair While Confusion Reigns

A horrible entanglement occurred in raising the body of the late beloved Pope Leo XIII to its provisional resting place into the loculus over the chapel door of the Basilica of St. Peter. High dignitaries of the church looked on in awe and amazement as the coffin containing the endeared remains of his holiness swayed to and fro over the heads of the bunglesome workmen as though it would fall and be dashed to pieces on the stones below. With old-fashioned pulley and windlass, relics of centuries ago, the workmen tugged away, while the machinery creaked and groaned as if it would fall to pieces. Suddenly there was a hitch, and the casket lunged forward, nearly freeing itself from the ropes. Then the coffin remained suspended in midair, and the men tugging at the antiquated windlass could neither move it up nor down. Ladders were finally procured and men climbed up to untangle the ropes. The onlookers, including many high in ecclesiastical ranks, became enraged at the proceedings, and, incited by

Antiquated Machinery and Ancient Mechanical Methods Causes Horrible Hitch in Raising Remains of the Late Pope

their censures, the crowd burst into shouts of threats and condemnation that threw the entire assemblage into the utmost confusion. It required the efforts of calm heads to restore order, and after a delay agonizing to all who were present the body finally reposed in the loculus.

So prolonged was the operation that the choir, whose duty it is to chant "I Am the Resurrection and the Life" during the ceremony, had to repeat the anthem in its entirety four times.

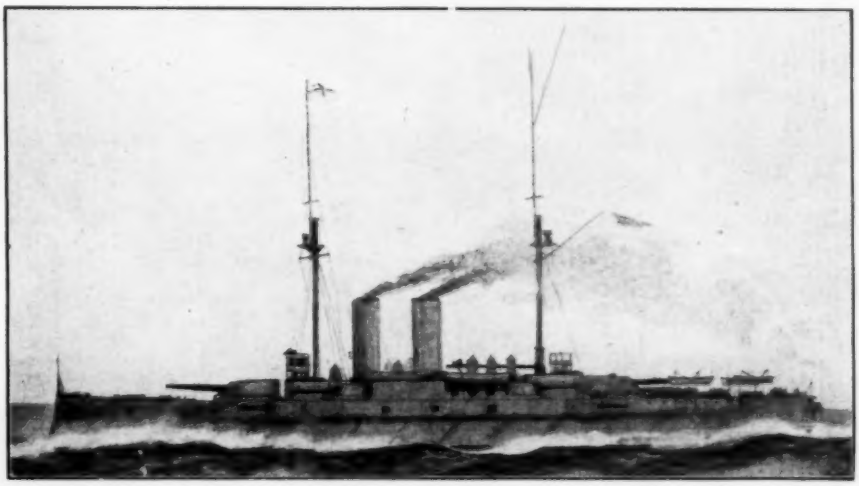
Had the ceremony been in America, as a prelate present remarked, the coffin would have been elevated easily and amid absolute silence by the mere pressing of an electric button, as is done in burials here, and all clumsy machinery would have been dispensed with. In Rome, however, the work had been but partially rehearsed, and machinery that would not be tolerated in an American work shop was intrusted to the sacred task.

The largest and most important bridge now under construction is a cantilever over the Mississippi river between Thebes, Ill., and Gray's Point, Mo. With the approaches it is 6½ miles long.

The Pennsylvania railroad is experimenting with steel telegraph poles. Before many years there will not be any other kind, and in many cases none at all, as the wires will be under ground along side the track.

## LARGEST BATTLESHIP IN THE WORLD.

The new battleship, King Edward VII., successfully launched by the Princess of Wales at Davenport, England, is the largest war vessel ever built. The cost of its construction was $7,500,000. The ship is of 16,350 tons displacement, 350 tons more than the Louisiana, now building at Newport News, and the Connecticut, building at New York. She is 440 feet long, has 78 feet beam, has a draft of 26 feet 9 ins. and has 18,000 indicated horse power. Her armor belt is from 8 inches to 12½ inches Krupp steel in thickness. Her armament consists of four 12-inch guns, four 9 1-5-inch guns, ten 6-inch guns and 24 guns of smaller caliber. She has four submerged torpedo tubes. Her estimated speed is 18½ knots. She carries 950 tons of coal and has a complement of 800 men.



Battleship King Edward VII

King Edward laid the keel plate of the vessel March 8, 1902. Among those present at the launching were the Prince of Wales, Princess Henry of Battenberg and the lords of the admiralty.

Emperor William has declared that it was Cornelius Vanderbilt's inventive and mechanical genius that caused him to bestow such honors on the young American and his wife during their recent visit to Berlin. It is said that the Emperor intends to bring about the use of the Vanderbilt firebox on German roads.

# To Reclaim the Arid Empire of America

## Egypt's Success Serves as a Lesson by Which a Desert Land Greater Than All Our Islands is to be Saved by Efforts of the United States Government

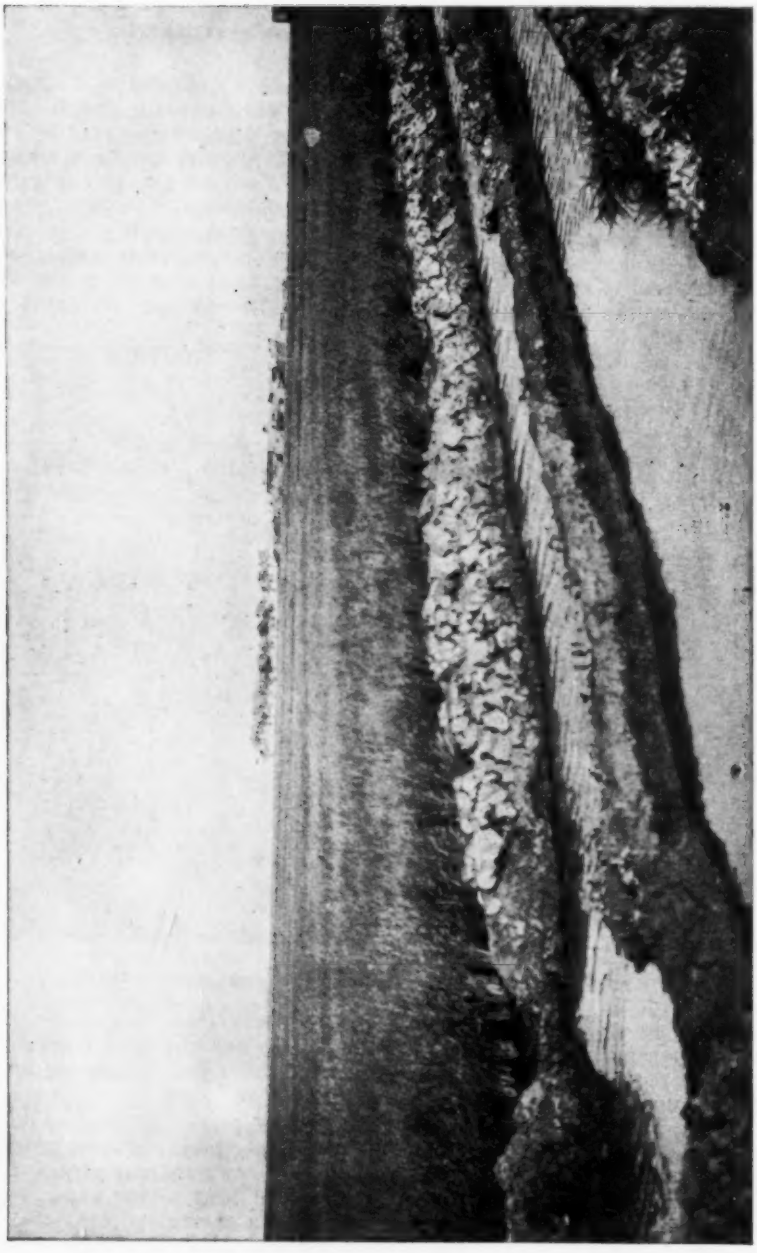
Influenced by the splendid success of efforts to reclaim the alkali lands of Egypt, equally ardent attempts are to be made to make verdant the alkali lands of America. Back of the great movement is no less an important power than the United States government. Already the most skilled scientists of the United States department of agriculture have been sent to Egypt to make careful investigations of the methods there employed, and a report on the digging of ditches, canals and reservoirs and the mechanical analysis of the soils will soon be forthcoming. Coexisting with this step the United States has now begun the work of irrigating lands in different sections of the west.

Ditching Alkali Land.—The First Step of Reclamation of These Lands in Egypt

The government has contracted for the construction of an irrigation canal to connect the Truckee and Carson rivers in Nevada. The canal will be 30 miles in length and will irrigate 8,000 acres of land near its banks. Ultimately the project is expected to reclaim 300,000 acres of arid land in Western Nevada and Eastern California, including the old Forty-Mile desert. The contract for the work as approved by the secretary of the interior has been awarded to Charles A. Warren & Co., of San Francisco, and the E. B. and A. L. Stone Co. of Oakland, Cal., at an aggregate cost of $945,000.

The cost of the irrigation system on which the government is at work in the state of Washington has already amounted to $2,330,758. The system as completed covers 154,962 acres and the total length of main ditches is 1,095 miles. There are now 4,585 irrigators in the state.

The expenditure of millions of dollars by the United States government for the reclamation of the hundreds of thousands of acres of arid land in the great west was discussed and favorably considered by engineers of the government reclamation service at the convention held in Denver, a few days ago. The conclusions of the conference will be reported to Secretary of the Interior Hitchcock by Chief Engineer F. H.



Egyptian Field of Rice Under Native Methods of Irrigation Without Drainage.—Rice Being a Shallow Rooted Crop and Growing Almost Continuously in Standing Water Will Thrive on a Soil Where Crops Requiring Intermittent Irrigation Will Not Grow on Account of Alkali During the Dry Stage

Newell and additional orders for active work will them be given.

Engineers in charge of the proposed works in Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, South Dakota, Utah, Oregon, Washington and Wyoming were in attendance. All favored the government's decision to reclaim the desert lands and predicted that the work could be done at much less expense than was required in Egypt. The Gunnison tunnel project in Colorado is one of the most gigantic works to be undertaken. Waters of the great Salt river reservoir in Arizona, the Pecos river in New Mexico, the Belle Fourche river in Utah and

of alkali has prejudiced outsiders in irrigation enterprises to such an extent that in many communities the subject has been exceedingly unpopular, and any reference to it in connection with certain localities has been vigorously opposed and criticised."

But the great work that has been done in Egypt has served as a most valuable lesson to the United States. The desert land there has been made to blossom and millions of acres now waving in grains and cotton a few years ago was an arid sterility. Egypt has suddenly been resurrected from its saline shroud and bids fair to again become one of the most prosperous of countries.

BASIN METHOD OF IRRIGATION IN EGYPT

Formerly all the cultivated lands were irrigated once a year by turning on from 2 to 6 feet of water, which was allowed to stand six weeks and then drained off when the flood subsided. There has never been trouble from the rise of alkali with this method of irrigation. The method did not, however, allow the growing of cotton or more than one crop in the year.

the Shoshone and North Platte rivers in Wyoming will be made to wash the thousands of square miles of arid land in their districts according to the government plans.

The word alkali is detested by all the tillers of American soil. They believe this salt product of the desert to be an indomitable foe to vegetation, and that nothing but barren waste can exist in its dread presence.

Here is what Chief Milton Whitney, of the Bureau of Soils, United States Department of Agriculture, says: "The subject of alkali has been a source of much anxiety to our western people, and the vast injury that has been done through the occurrence

There is an extent of alkali waste in America as wide as was that of Egypt, only the percentage of alkali is not as great. The methods that reclaimed Egypt's lands will reclaim America's. Mr. Whitney says:

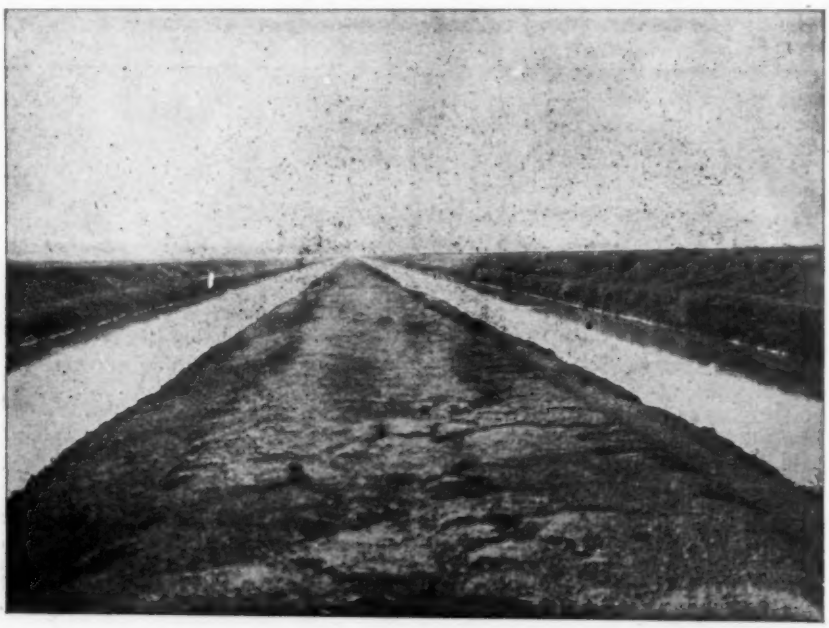
"The experts of the Bureau of Soils firmly believe that the damage from alkali lands in this country can be economically reclaimed, and that the damage from alkali is unnecessary and will not result if proper precautions are taken. Furthermore it is a well-known fact that in most cases alkali accumulates in the most fertile soils, and the presence of alkali in the soils of arid regions should indicate to the people as a

rule a high grade of fertility, provided proper methods of handling the soil are adopted."

There are in the United States more than nine million acres of land that contain an excess of alkali salts. The United States government is now making experiments on a tract of 40 acres of land containing on the average of 6 per cent of alkali to a depth of 6 feet that has been taken up in the great flat between Great Salt Lake and Salt Lake City. The land has been underdrained and subjected to a single flooding. A similar experiment is being conducted in the Central Colony at Fresno, Cal., on a tract of 20 acres. The drains have just been installed and the irrigation waters turned onto the land. Similar work is being started at Yakima, Wash., and it is proposed to start another demonstration work at Billings, Mont.

Mr. Thomas H. Means, in charge of alkali land reclamation of the government Bureau of Soils, was sent to Egypt to accompany Thomas H. Kearney, of the Bureau of Plant Industry, to make investigation of the reclamation work there. He will soon make a report on the various methods employed in the world-famous work of resurecting that land that a similar process may be used to save the desert empire of the United States, a land more extensive and valuable than all our boasted insular possessions. Probably the reclamation of the salt land at Abukir is the most successful in Egypt. Mr. Means has made a careful study of the work here and in his report he will state:

The first step toward reclamation is the construction of canals for irrigation, and ditches for underdrainage. Irrigation water is taken from the Mamoidieh canal by a large canal which subdivides and ramifies over the entire area to be irrigated. The main drain discharges into Lake Mareotis through a siphon under the Mamoidieh canal. The water from Lake Mareotis is pumped into the Mediterranean by a large plant operated by the Egyptian government at Mex, about ten miles southwest of Alexandria. This pumping plant maintains the level of the water at Lake Mareotis at about 8 1-5 feet below sea level. The original plan for the drainage of Lake Abukir provided for a pumping station on the coast, and the outlet of the lake on the north, but this station has now been abandoned. There are two methods of placing the canals and drains, both of which are in general use. In one the secondary drains run halfway between the secondary canals, and into them the tertiary drains, or laterals, run from



Main Drainage Ditch in Wady Tumilat, Used in Modern Methods of Reclamation
These ditches are run parallel, so that one may be emptied for cleaning while the other carries the drainage waters

each side. The tertiary ditches are 492 feet long, 31½ inches deep, 9 4-5 inches wide at the bottom and 49 inches wide at the top. The distance between the drains is 164 feet. These lateral drains subdivide the land into areas 492 by 164 feet, containing about 1.83 acres. This tract is called a gata, and is the unit used in renting the land.

The main differenece between this and the other plan in use is that in the latter the secondary drains run beside the secondary canals, and serve as infiltration drains to catch the water which seeps from these canals, and the tertiary drains are 984 feet long, or twice the length of the drains in the first plan. It will be seen that in this plan a smaller amount of ditching is necessary, and where the land has the requisite fall to permit the use of such long drains this system is to be recommended. The cost of the canalization amounts to about $12.50 per acre, including all expenses of buildings, machinery, etc.

After the canals and drains are dug and the land is sufficiently level to permit uniform flooding, water is turned into each gata to a depth of 4 inches. When possible this depth is maintained until the land is ready for a crop, but during the season of low water in the Nile the use of water for reclamation purposes is not permitted, so that there are times during the year, when this land has to remain dry.

During the time the water remains upon the land the salt which the soil contains is dissolved and carried away by the drainage water. The drainage water is very salt and is said to contain at times over 10 per cent of sodium chloride.

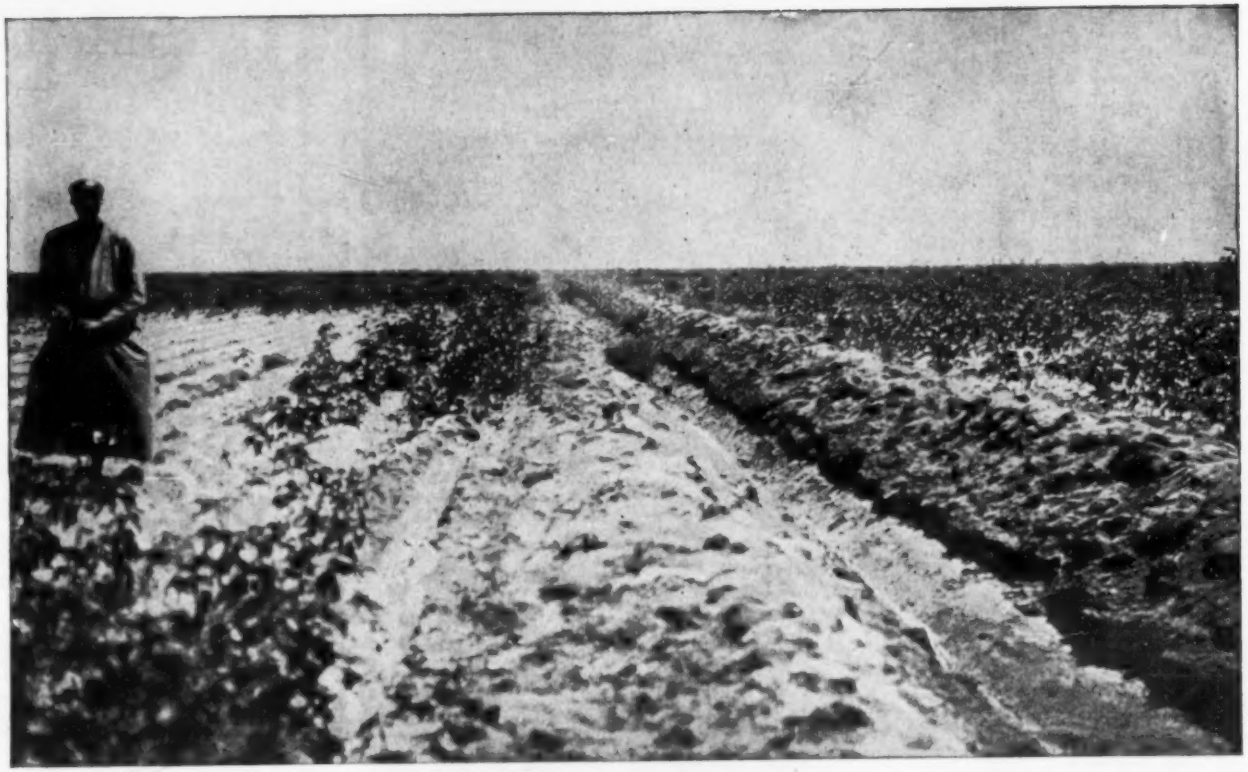
If the first season's washing has not sufficiently sweetened the land it is plowed during the summer months, when the water is not abundant, in order to reduce the surface evaporation to a minimum.

At the end of the second year the land is usually sufficiently sweetened for some crop. Samples of the soil are examined for the percentage of sodium chloride content, as experience has shown that this is an indicator of the condition of the land as regards crop growth. The first crop to be grown is barnyard grass, by the natives called "dineba." If the growth of this grass is good, the soil is considered in a condition, for the introduction of other crops, and as a rule Egyptian clover is then planted. While these crops are on the ground the land is heavily flooded, as much water being used as the plants will stand, so that there is no opportunity for the alkali that has been washed down to return to the surface.

The "dineba" is planted upon the flooded

**Samar, a Shallow-Rooted Crop, on Alkali Land in Egypt**

**The alkali is being washed from the soil by flooding while the crop is growing. Samar is used for making mats and rugs**



**Field of Cotton on Newly Reclaimed Land in Egypt**

After the soil is sufficienlty reclaimed for clover, cotton is planted. This picture shows a spot where the alkali is too strong for cottou, and on which dineba or barnyard grass will again be planted and the land heavily flooded for more complete reclamation

land, and the crop generally remains upon the ground for six weeks or two months. It is then either pastured by sheep or stock or is cut by hand and fed green. As the land sweetens salt weeds and bushes begin to grow vigorously, so that it is necessary after cutting the "dineba," to go over the fields and clear them of this brush. The land is then flooded and sometimes harrowed, and as the water soaks away Egyptian clover seed is sown upon the wet surface. Clover occupies the ground during the fall and early months, and if its growth is satisfactory cotton is planted the following winter. When cotton can be successfully grown the land is considered to be fully reclaimed. This rotation is the one in general use, but at times other crops, such as corn and sorghum, are introduced.

It was found that, on the average, "dineba," or barnyard grass, will not withstand, more than 0.6 per cent of soluble matter in the first foot of soil. Egyptian clover requires the first foot to be even freer of salt, while Egyptian cotton has been found growing in soil that has as high as 1 per cent of salt in the surface foot.

It seems that the value of barnyard grass and Egyptian clover as reclamation crops is not due to the fact that they are able to withstand a large amount of salt, but to the fact that they are very shallow rooted, growing in the immediate surface soil which has been washed free from salt, and are adapted to a very wet soil. Egyptian cotton, however, is a deep-rooted crop, its roots growing down into the subsoil, which is still charged with salt. Therefore the Egyptian cotton is actually more resistant to salt than the other two reclamation crops, though the best grades of cotton are not produced on salt lands.

Flooding with open drains is the method in common use in Egypt. The land is thoroughly leveled, open ditches to a depth of 32 inches are dug at intervals of 150 to 450 feet, and the land is banked up and flooded to a depth of 4 inches until sufficiently leached of alkali or salt to permit plant growth. This method is thoroughly effective for the removal of salt but has the objectionable feature of open ditches.

The Colmatage or warping method of reclamation consists simply in flooding land with muddy water long enough to allow the mud to settle after which the clear water is drawn off and more muddy water run on. Large quantities of water are required and much land is made swampy. As an efficient and permanent remedy for alkali land, this method cannot be recommended for general use.

Flooding with tile drains is a method that has only been tried experimentally in Egypt, but promises to be the most rapid and effective way of reclaiming the land. Tile drains are placed 30 inches deep and 35 feet apart, at a cost of $30 per acre.

In applying these methods of reclamation to American conditions there are a number of factors which enter into the problem and make necessary certain changes. American farmers have a well-grounded dislike to open ditches in fields. They take up a large amount of valuable land, require an annual outlay in cleaning and deepening, necessitate the building and annual repair of bridges, and prevent or hamper the use of machinery in agricultural operations. Tile drains take up no room, render no land unavailable for cropping, require little or no repairs if properly laid at the start, and are efficient for many years. One hundred feet of open ditch 7 feet wide occupies 700 square feet of land; the value of this, at $100 per acre, would be $1.61. The cost of digging 100 feet of open ditch of this width, 3 feet deep, is at least $4. The cost, in our Eastern states, of digging, laying tile, filling the trenches, and purchase of 4-inch tile for 100 feet of drain is about $4, so that there is a difference of $1.61 per 100 feet, in favor of the tile. If allowance is made for cost of bridges and annual cleaning of open ditches, the difference will be still greater.

The soils in arid America are generally light in character and do not stand well in bank, so that great trouble would be experienced in maintaining small open ditches.

For these reasons alkali land reclamation by means of open ditches is not to be recommended for general use. In the larger drains, where very large pipe would be required, open ditches may be used, but in a great many localities some kind of protection will be necessary to strengthen the banks and prevent their caving.

The irrigation season, except in certain parts of California and Arizona, is shorter than in Egypt, and in order to reclaim land within a reasonable length of time it will be necessary to place drains closer together. In this way the land will be reclaimed in a shorter time, because a greater quantity of water can be run through the soil in a given time. In an experiment on 40 acres now being carried on in a loam soil near

Salt Lake City, Utah, the tile were placed 150 feet apart. This seems to be a good average distance at which to place tile. As the experiment progresses more definite information regarding the time required for reclamation can be given.

Pumping for the removal of drainage water is very expensive. It is so considered wherever used, though frequently conditions make it possible. Pumping from large drainage systems has certain very definite limitations and, wherever possible, a gravity outlet should be dug. Often a gravity outlet proves very expensive to install, but, unless there are great difficulties in the way, it will be found cheaper and more effective in the long run.

## THE NEW LIGHT IN THE STEEL FIRMAMENT.

William Ellis Corey, the new head of the United States Steel Corporation, named to succeed Charles M. Schwab, was born May 4, 1866, in Braddock, Pa. He received little education, save such as the Braddock schools afford, and at the age of 16 began to take up the real burden of living. At that age he obtained a position in the laboratory of the Carnegie Steel Company. In his spare time he studied chemistry. His work and his proficiency soon attracted attention, and he was sent to the order department of the Homestead Steel Works.

When he was 21 he was appointed superintendent of the plate mill and open hearth departments. His next step was to the superintendency of the armor plate department. He had been continuing his studies in the laboratory, and these now bore practical fruit. To him was due the introduction of a new forging process, which greatly increased the ballistic resistance, and which is highly valued by ordnance engineers.

Finally Corey succeeded Schwab as general superintendent of the Homestead Steel Works, and subsequently he was promoted to the presidency of the Carnegie Steel Company. On receiving this appointment Mr. Corey found that it would be necessary to move to Pittsburg and take up his residence. Two years ago he went there to live, leaving behind his friends of the mills in Braddock and Homestead, where he had spent most of his life. As head of the United States Steel Corporation he has now taken up his residence and made his business headquarters in New York. In the mill towns every one calls him "Bill," and "Bill" Corey is one of the most popular men that ever lived in either Homestead or Braddock. Mr. Corey's particular fads are baseball, football, horseflesh and travel. He is an enthusiastic "fan," and has a private box at the Pittsburg baseball grounds.

## SUNSTROKE AND HEAT EXHAUSTION, AND WHAT TO DO.

The two conditions of sunstroke and heat exhaustion, though occurring from similar or identical causes, are not the same, says the Journal American Medical Association. In heat exhaustion the temperature is only slightly elevated, and may be subnormal, while in sunstroke it is usually well above 103 degrees. Correspondingly, the skin is comparatively relaxed and cool in heat exhaustion, while it is hot and flushed in sunstroke. Unconsciousness and convulsions are rare in heat exhaustion, but are common in sunstroke. Corresponding to the condition of the temperature, the pulse in heat exhaustion is rapid, feeble and perhaps almost imperceptible, but in sunstroke, although it is rapid, and may be feeble, it may also be full. The pulse, therefore, cannot in all cases give much assistance. If further evidence is necessary to establish a diagnosis, there may be the history of the patient having complained, in heat exhaustion, of suffering from intense heat, or if he is conscious—as is usually the case—he may himself describe his previous feelings. On the other hand, in sunstroke, the attack in most cases comes on suddenly, and the patient is apparently stricken down while suffering no inconvenience. When diagnosis is made the treatment, it is easily seen, differs in the following: In heat exhaustion the subnormal temperature must be raised to normal; in sunstroke the overheated condition must be reduced. The patient suffering from heat exhaustion must be protected from drafts, have external heat applied and stimulants given. In sunstroke, the stronger and colder the draft the better. The patient should be rubbed with ice, be given cold water enemas or ice packs, and other measures should be used to reduce the temperature. In sunstroke stimulants should never be given while the temperature remains high and the period of depression following the reaction has not arrived. In case of either affection the patient must be warned to resume work moderately, and only after sufficient time for convalescence. He must be further warned that he will be more liable to such attacks in the future.

# Growth of Industrial Art

**These are the first of a series of illustrated articles to be presented by Popular Mechanics on the growth of industrial art. After laborious research and considerable expense the publishers have been able to obtain pictures and data describing the evolution of all the important mechanical devices that make up our present day commerce. All these devices, as the articles will show, had their begin ing in crude conceptions. The description and illustrations of these will be of intense interest to those of inventive minds, as showing the quaint creation that probably merely furnished the idea of which the present useful device is the outgrowth. Many of the "progenitors" of our modern machines were little more than toys. Many of them were ridiculed even by people of their day and their inventors held up to derision. But the principle on which they were based led to important discoveries that often have revolutionized the industrial world. Even now many such originals are being born every day, most of them to receive jeers or mere passing notice, but probably to figure conspicuously in the world's industry in after years.**

**The reader will doubtless appreciate that it was a search of world-wide scope that enabled Popular Mechanics to obtain the illustrations and data contained in this series. Libraries of foreign lands and numerous historical archives and private collections were searched in the effort. For our success we are indebted for the assistance rendered us by the London Institution of Civil Engineers, the "Centralblatt der Bauverwaltung," of Berlin, the French "Societe des Ingenieurs Civils," of Paris, the American Society of Mechanical Engineers and the American Society of Naval Engineers.**

## HISTORY OF THE BICYCLE.

### Modern Motor Vehicle Doubtless the Outgrowth of the Ancient Hand Propeller.

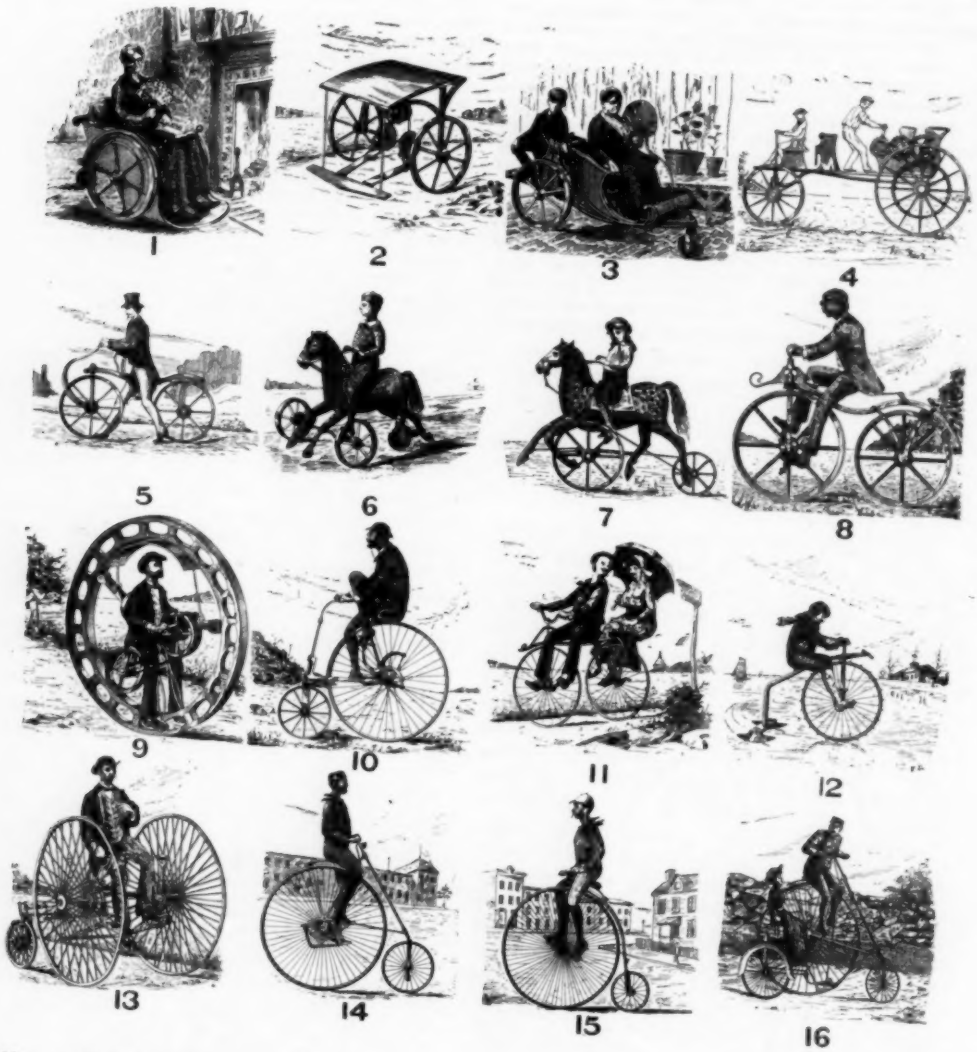
The modern motor bicycle that has attained a speed of 45 miles an hour, and whirls along the roads and streets without an effort of its rider, save that of guiding the machine, doubtless had its origin in the old-fashioned hand propeller chair of more than two centuries ago. The idea of this chair led to numerous conceptions of hand propelled vehicles until the year 1816, when appeared in France a very curious foot-propelled machine constructed and used near Rochelle. It consisted of two wheels of equal size placed one in front of the other, connected by a bar on which was a small seat. It was operated by the rider striking his feet on the ground, on the same principle as the English dandy horse, shown in Fig. 5. This appears to have been the real progenitor of the modern bicycle. In the early part of the nineteenth century a machine called the "celeripede" was invented. The first application of the wrench axle was patented in the United States by P. W. McKenzie in 1862.

In the years 1868 and 1869 the velocipede came into sudden popularity, but was superseded by the bicycle, which was imported from England.

The first approved bicycle was exhibited at the Philadelphia centennial exhibition in 1876. The first American company for the manufacture of bicycles was organized in 1878. It is estimated that 6,000 were manufactured and sold in the United States in 1884, and that 30,000 were in use in the United States in 1885. These were the old style large and small wheel bicycles, such as are still often used on the stage by trick riders. In this same year the safety bicycle, with which we of the present day are all familiar, made its appearance and marked a new era in the manufacture of this class of vehicle.

James Stanley, of England, in 1885 made the first safety with balance gear, and J. K. Starley practically and commercially established the machine by new improvements in 1886. Nine years before this, however, Henry Bolt and George Shergold were working on the idea. W. Brown's ball-bearing appeared at about the same time, and in 1888 J. B. Dunlop, a veterinary surgeon, came forth with the new tire, that yet bears his name. This was substituted for the old solid or cushion tire, and the bicycle abandoning its "bone shaking" habits of former days and gaining greatly in speed sprang into favor all over the world. American and European manufacturers for a time were unable to supply the demand. Shops that had started with a few hundred dollars capital became worth millions. Soon American skill and workmanship was producing the best bicycle on the market, and it was clamored for all over the world; but they could not be made fast enough to supply the home market and European trade was disregarded. It was found that money could be made faster by manufacturing shoddy vehicles in quick time than by turn-

ing out substantial machines in longer time, so the cry was to get the "wheels" on the market in any shape. The result was that standard makes were found to be little more than patch work. People became disappointed and disgusted. The bicycle sank into dis-




No. 1—Hand propeller, 1700.
No. 2—French pedal, 1750.
No. 3—French hand propeller, 1770.
No. 4—American hand propeller, 1804.
No. 5—English dandy horse, 1818.
No. 6—United States patent, tricycle, 1864.
No. 7—United States patent, tricycle, 1865.
No. 8—United States patent, bicycle, 1866.
No. 9—United States patent, unicycle,
No. 10—United States patent, bicycle,
No. 11—United States patent, tandem,
No. 12—United States patent, ice, 1883.
No. 13—United States patent, 1883.
No. 14—United States patent, bicycle, 1884.
No. 15—United States patent, bicycle, 1884.
No. 16—United States patent, sociable,

favor. Great companies found themselves overstocked, and all but a few of the strongest went to the wall.

The popularity of the bicycle, however, promises to be revived with the "motor wheel," the very latest device in the history of the velocipede. This vehicle has made enormous speeds, and is propelled by either steam or gasoline explosions, or by the feet as in the safety bicycle, when the motor is out of order.

Thus it seems that every age for more than a century has had its particular style of velocipedes. They alternately go out of style and spring into popularity again. It would be interesting to know what will be the successor to the "motor" bicycle.

The abandonment of the tall towers and network of receiving wires in wireless telegraphy are among the improvements promised for the near future.

## Evolution of the Loom

Joseph Marie Jacquard, inventor of the Jacquard loom, was a straw hat manufacturer of Lyons. His invention produced a complete revolution in the art of figure weaving. He was born in 1752 and died in 1834. His incentive was a prize offered for the production of a machine for making nets. Napoleon's attention was called to Jacquard's wonderful inventive genius, and the inventor was asked if he could not improve on a loom belonging to the French government, which was designed for weaving shawl patterns in imitation of cashmere, a process that was very expensive.

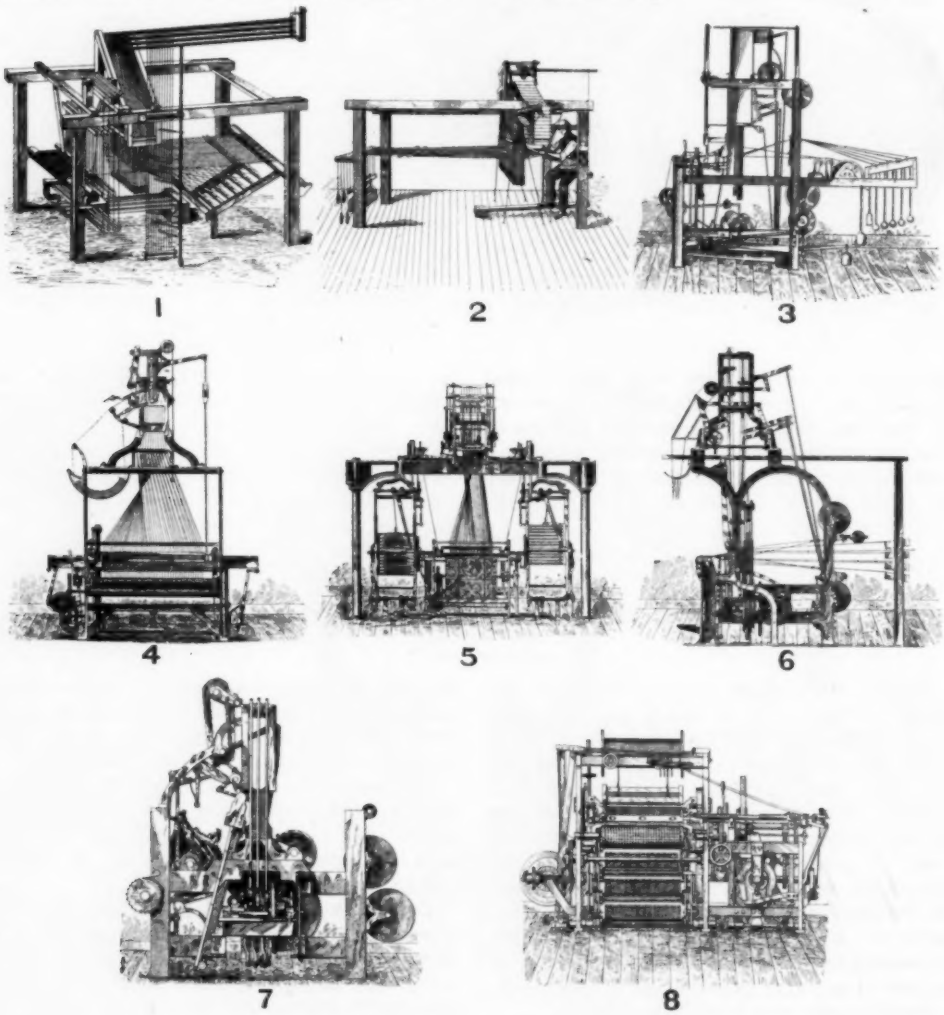
Jacquard, as a result, improved on the model of Van Causer, produced the famous machine which bears his name, and was awarded a pension of 6,000 francs ($1,140). He was also awarded a bronze medal at the French exposition in 1801. His invention at first excited great opposition from the weavers at Lyons.

Jacquard was one of the few inventors who reaped a pecuniary reward from the product of his genius, for besides his pension he received a royalty of 50 francs ($9.50) on every machine sold.

Draper, in 1834, 1835 and 1837, took out patents for Jacquard's application to the lace frame. He was the earliest and most ingenious, though not the most successful, pioneer in finding out how every thread in a machine might be as simply and perfectly controlled as those on a pillow by the fingers of a workman. Draper's means failed him before he had quite accom-

plished this, but his diversified combinations of lace machinery were the real germs of those which have been perfected by his successors with great profit to themselves and to the establishment of the trade; yet this clever mechanic fell into deep poverty and died nearly penniless, as none would come to his rescue.

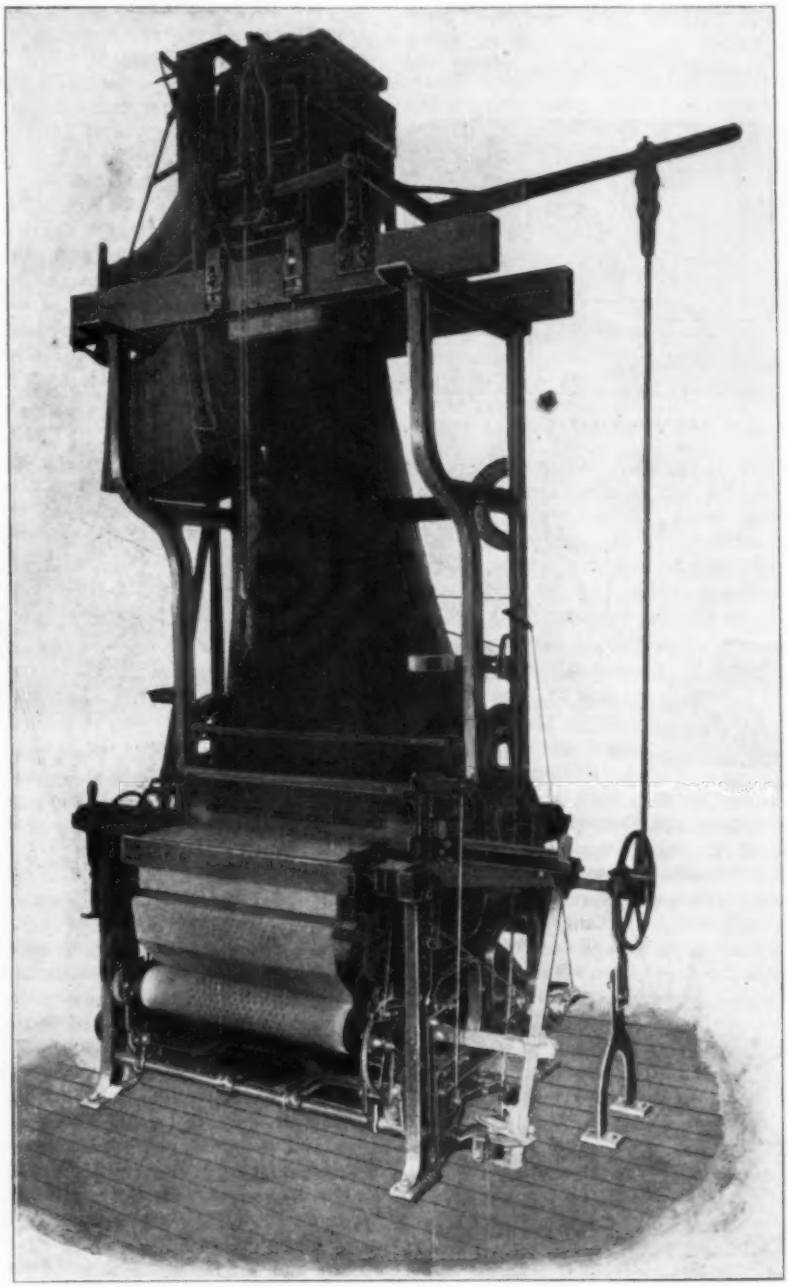
By 1840 the application of the Jacquard to the lace machine had been perfected. Oldknow, in 1849, added the use of very thin steel bars, pierced so as to pass warped threads through them and guiding the movement of each sideways, right and left. Articles were thus made from the narrowest braid to a highly figured lace curtain two or more yards wide and requiring ten or twelve thousand cords to produce the pattern. Oldknow granted 1,170 licenses. The complex operations governed from the ends and backs of Levers' machines are carried on in a small space, but through their whole width of perhaps 200 inches safely and exactly, prompt attention being given to remedy and defects in materials or workmanship.




LOOMS—JACQUARD AND MOQUETTE.

No. 1.—Primitive Draw Boy.
No. 2.—Primitive Jacquard.
No. 3.—U. S. Patent, Power Pile Wires—A. D. 1857.
No. 4.—U. S. Patent, Jacquard—1842.
No. 5.—U. S. Patent, Power for Weaving Ingrain Carpet—1849.
No. 6.—U. S. Patent, Power for Weaving Double Pile Fabrics—1851.
No. 7.—U. S. Patent, Moquette—1856.
No. 8.—U. S. Patent, Moquette—1881.

In 1841 Deverill had patented a claim to the first successful application of the Jacquard to the end of a lace frame. Birkin bought the invention from Deverill, but, seeing doubt arise, relinquished his supposed right, and with most praiseworthy spirit thus restored freedom of action to the fancy lace industry, in which direction alone general profit was to be hoped for.

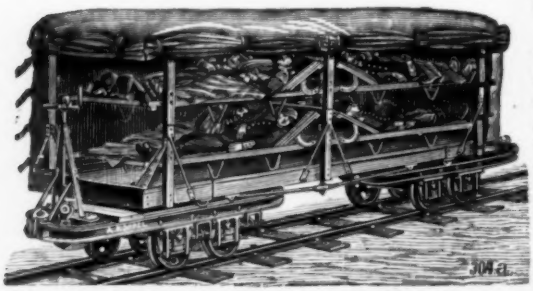


Latest Jacquard Power Loom

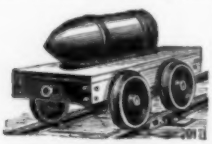
## QUEER CARS FOR ARMY SERVICE.

### Run on Portable Tracks and Serve Many Valuable Purposes

Some odd looking little cars for army use have made their appearance in America and America's possessions during the late activity in military affairs. Cars for carrying shells, for hauling army material, for dumping work, for conveying sick and wounded soldiers to the hospital, for hauling officers through country where no permanent railroad exists, and for many other services have sprung into use in a decade.



Ambulance Car



Shell Car

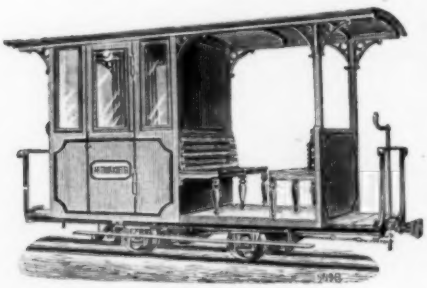
These particular cars are built to run principally on portable tracks. The track is often hauled by the cars themselves, laid and used for service in certain localities while operations are there in progress, and then the tracks are taken up and hauled to the next field of operations. The cars of necessity are very small, and the rails are light and easily handled.

In carrying sick and wounded soldiers the queer looking cars have served a splendid purpose. The soldier by the specially arranged top is protected from the burning heat and he is given an abundance of air by the open sides. They are well equipped with springs and ride very smoothly over their temporary tracks.

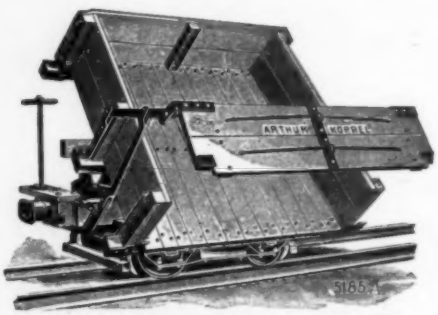
The cars for carrying shells are usually employed at the factories where the shells are made. The one shown is a small heavy platform car for carrying very large shells.

The little passenger and freight cars are especially adapted for service in the tropics and are doubtless destined to become exceedingly popular in the army, as they permit the establishment of a small temporary line between the camp and the nearest town for conveying officers and men to and fro and for hauling supplies. Hand, animal, steam or electric power is employed.

There is a great factory at Hoboken, N. J., headed by Arthur Koppel, engaged in the manufacture of these cars and railways, with all accessory materials and supplies.



Officer's Car



Dumping Car

## HOW TO PREPARE PHOTOGRAPHS FOR PAINTING.

Painting photographs with a glossy surface, such as albumen or ordinary gelatinochloride prints, says American Amateur Photographer, is a matter of some difficulty; if water colors be used the difficulty may be overcome by wetting the brush, instead of with water, with the following solution: Albumen six drams, water and glycerine one and a half drams each, ammonium carbonate fifteen grains, ammonia one drop. If oil colors are to be used, it is a good plan to coat the print with a mixture of gelatine and gum arabic before applying the colors. Many use weak fish glue solution also, preserved with formalin.

## RADIUM BAFFLES MORTAL MINDS

### Easily Defined But Seemingly Impossible to Comprehend

The stupendous theory, for some time foreshadowed, and now apparently substantiated by study of the new substance radium, has finally engaged the world's foremost searchers after the ultimate secrets of the universe. Prof. Cookes, Prof. Lodge and Prof. and Mme. Curie have proclaimed that it is easy to define this great revolution in science in scarcely more than a sentence, but to comprehend it is almost as far beyond the power of human minds as the idea of eternity or infinite space.

The old theory that the atoms of elements consist of indivisible units of matter now is definitely discarded. Instead we now are told that each atom is a whole stellar system of infinitely smaller but absolutely identical units, all in a regular orbital motion. An atom, it is said, consists of 700 such units, or ions. The nature or identity of each substance depends upon the number of such ions contained in each atom. Thus 11,200 ions in each atom produces what we known as oxygen; 37,200 of the same ions, if combined in a single atom would yield what we regard as good as gold. The nature of these ions are, for want of a better word, electrical. In other words, electricity and matter are one and the same thing.

This theory has been more or less familiar to scientific men for two or three years, but it has been undemonstrable until recently. What Roentgen rays suggested now radium seems to furnish complete. Prof. Curie's examination of radium and other phenomena leads Prof. Lodge and his associates to believe that matter is not stable in its atoms, as heretofore supposed. Everybody is familiar with the disintegration of matter, which means a rearrangement or recombination of the elements. Thus water may be separated into oxygen and hydrogen, but it never before was imagined that the atoms themselves were capable of disintegration.

Prof. Lodge suggests this is a notable process of nature, yet it is proceeding at a rate so slow that it baffles the powers of conception of the human mind to estimate the length of time required. In radium alone it proceeds so rapidly that the phenomena is easily observed.

Prof. Curie, the discoverer of radium, in some wonderful experiments at the Royal Institution showed that radium spontaneously and continuously disengaged heat so rapidly that it affected photographic plates, even through opaque bodies. It discharged an electroscope when merely brought in its vicinity and gave off emanations similar to itself in constant, even violent, streams or radiations. In other words, the 150,000 ions, which composed each atom of radium, rotated so violently that they flew apart into original units. It has been calculated, however, that this efflux from radium is so infinitely small that a square inch of surface would lose only one grain in ten thousand million years. Prof. Lodge surmises that this process of disintegration of atoms may constitute the evolution of the chemical elements.

The lecturer announced that within a few weeks Prof. Rutherford had observed the breakup of the most massive atoms. He found that a few atoms of a radioactive substance seemed to reach a critical stage, at which they fling away small portions of themselves with great violence, the residue having the same property of unstability for some time until ultimately it settles down into a presumably different substance. Changes of this sort in more stable atoms would seem to require millions of millions of centuries—so long, in fact, that the longest periods in astronomical evolution seem but hours in comparison.

Prof. Lodge affirms, however, that these changes seem bound to occur, according to fixed laws. So the state of flux and decay is recognized not only in the stars and planets but in the foundation stones of the universe. The elemental atoms themselves are in process of regeneration. It is impossible to imagine what would occur if the separate ions ever aggregated themselves together by their mutual attractions into fresh material. The progress of the research may lead to the discovery of the existence of atoms, some recently formed and other ancient.

It will be seen the whole theory in effect is an astronomical one. One is led to wonder, then, if the earth and the other planets are not mere ions forming a single atom of the higher universe—where, perhaps, they constitute the speck of dust that worries the careful housewife in the world next above us. At all events we clearly are on the verge of the greatest revelations of science yet vouchsafed to mankind—a knowledge so gigantic that it is only limited by the capacity of the human mind to receive it.

## LIPTON'S REMARKABLE CAREER.

### Began Life Penniless as a Cabin Boy—His Business Now Pervades the Earth

Sir Thomas Lipton, now the friend and associate of royalty and whose fortune is estimated at $100,000,000, started life as a stripling cabin boy on a coasting vessel without a dollar in the world, and was faced with the imperative duty of supporting his parents. At the age of 15 he emigrated to America in the steerage of an old fashioned liner, desparately poor, sick and friendless. First in New York, and then in the South and then again in New York, always managing to send a little to the old people at home, until in poverty and privation and denial, he had saved about $500. With this he returned to his parents, whose necessities in growing age compelled his presence with them, and set up a little business in his native town of Glasgow. There he opened and swept his small store every morning with his own hands, served his customers throughout the day and slept under his counter. His business prospered, was steadily enlarged until now it spreads throughout the world. He handled the bit of a Glasgow shop with the same early and late devotion to and masterly of detail that characterize his business today in the four quarters of the globe. For the market boy of yesterday of a Scotland town has today reached out through all the empire of Great Britain, into every country of continental Europe, into China and Japan, to the ownership of the Ceylons, into Africa, the Republics of South America, the West Indies, the far islands of the eastern sea and into our own United States where his interests are second only to those of his own native land.

Sixty of his great stores are in London alone with branches in every capital of Europe. Fruit farms are in Kent. Bakeries and biscuit works are in Glasgow; curing factories in London, Liverpool and Glasgow; an enormous wholesale packing house and depot in Chicago, and its meat stores and refrigerator cars all over America; in Ceylon, the greatest plantations in the world. Every week a new "Lipton's market" is opened somewhere. Every week more than 200 tons of tea are sold.

More than 5,000 principal agents, directly responsible to Sir Thomas, are scattered throughout the world, representing him and superintending his establishments. City Road, London, is the nerve center of this colossal system. At 8 o'clock the master of all this, who still works 15 hours of every working day, seats himself behind his thoroughbred American roadsters, at his home in Southgate, and at 9 o'clock is at his desk in City Road headquarters. On the side arms and top of his desk are piled his personal correspondence; letters, telephone messages, telegrams, cablegrams from all over the world. With the quick movement so characteristic of him, Sir Thomas rolls away the desk top and begins his day's labors.

This office desk is a remarkable affair, calculated to astonish even a world trotting, inquisitive, inventive American, to whom Sir Thomas not long ago explained its mechanism. About every visible portion of its anatomy is covered with contrivances, electrical, automatic, mechanical, for the use of its owner. On its broad surface of polished mahogany are innumerable buttons, numbered and lettered, the pressing of which seem to put him into literal touch with the uttermost parts of the earth and sea.

Everywhere throughout the establishment are perfect systems and clockwork regularity and contented workmanship. More than 10,000 employes are on the pay roll at this one place, and every one of them may have direct access to Sir Thomas. When England was shaken with labor troubles, he remarked:

"I never have had a strike and never shall have one. I make it my business to look after the interests of my men, and we live in peace and harmony."

This is one reason why "Lipton, Limited" has become what it is and pays his majesty's government more money for duty than any other firm in the empire.

Today the boy who slept under the counter of the little Scotch shop is looked upon by his government to manage its most important commercial interests abroad. At Osage, his magnificent country seat near London, he has entertained most of the peerage of England. He has become world famous for his princely charities. He has been knighted by the late queen and is an intimate friend of the present king.

Mrs. Skrapp—It seems to me to be so ridiculous to refer to a tugboat as "she."

Mr. Skrapp—That's so; tugboats do actually accomplish some good in the world.

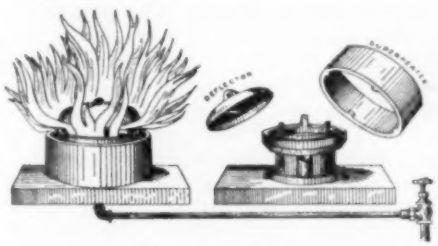
Mrs. Skrapp—Yes, and they puff and blow about it so.

## PRACTICAL DOMESTIC OIL BURNER.

A man in California has devised a wickless burner for burning distilate, which is a low grade of oil costing in California about five cents a gallon. One gallon will last five hours, and when once lighted the burner needs no attention for 48 hours. The burner can be placed in an ordinary cook stove, and safely operated by a child.

This type of burner, says Domestic Engineering, is known as a draft burner, and in principle is like the Argand lamp, in that the path of the flame is through two separate currents of air which provide the necessary oxygen for perfect combustion. It is so constructed that the air becomes carburetted or mixed with the oil vapor at the moment of gasification, the principal air port admitting the air through the center of the burner, and thus sufficient oxygen is allowed to mix with the volatile gases before the igniting point has been reached as they pass through the opening under the cap or deflector of the burner. Air is also admitted on the exterior of the burner within a superheating ring, and thus a sufficient amount of superheated air is given the burning gases to effect perfect combustion.

When a fire is desired, the needle valve is opened, which allows the oil to flow to




Domestic Oil Burner

the burner, and after the oil receptacle of the burner is filled, a match being applied, in three or four minutes the casting becomes very warm and gasifies the oil. A lower cup prevents the oil from overflowing from the top receptacle into the lower portion of the stove.

Three years at least must elapse before the Hennepin canal is completed, according to the statements of Major Willard, the army engineer, in charge of the work.

The Illinois Central Railroad intends to convert all its Chicago suburban lines into electric lines.

## MUST PAY RENT FOREVER.

### Can't Buy Graves in Cuba and When Regular Payments Cease the Buried One is Ousted

In Cuba there is no such thing as "the last resting place," unless the grave rent is kept up with regularity forever after death. Rent

Homeless Skeletons

is charged on the quarters occupied by the dead the same as by the living, and when the payments on the sepulchral abode are not forthcoming, the tenant is ousted with as little ceremony as a delinquent would be evicted from a modern Chicago flat, and the person ejected from the Cuban grave has absolutely no say-so in the premises. The picture shows the result of a bill for grave-rent overdue. The evicted one is strewn along on the top of the fresh dirt embankment. The landlord of the city of the dead sent his bouncers, who effected entrance to the noiseless subterranean home by means of pick and spade, and after a few minutes' work there was another place for rent in the silent town, while the deposed one looked on nonchallantly. Such incidents as these are common in Cuba. When a respectable person of moderate means is born his rent-paying begins, never to end, unless he meets the fate of the disturbed Cuban shown on top of the dirt mound.

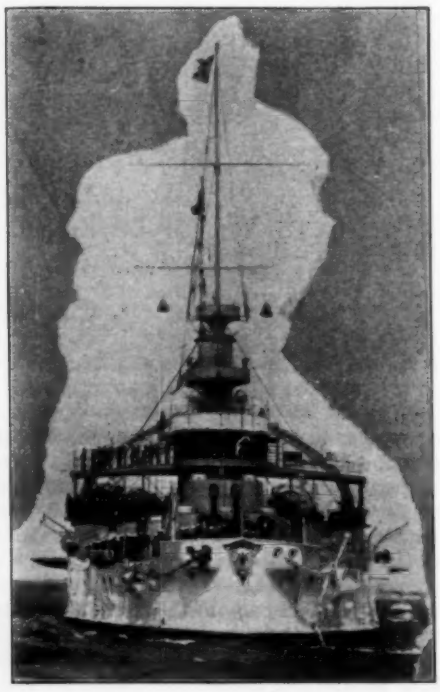
A Kansas farmer's pretty daughter gives three kisses and a hug to the one of her father's harvest hands who shocks the most wheat during the day. This in itself is enough to shock the wheat and everything else on the ranch.

# Kearsage Breaks World's Battleship Record

## Makes Trip From England to America Without Injury at 13 1-6 Knot Speed

By Joseph N. Hemphill, Captain of the Kearsage, which broke the world's record for speed of battleships in the trip across the Atlantic Ocean from England, July 25.

The Kearsarge left The Needles at 1:25 p. m., Friday, July 17, and arrived at Mount Desert Rock at 12:30 p. m., Sunday, July 26, covering the distance of 2,900 miles in 9 days 4 hours and 15 minutes, an average of 13 1-6 knots an hour, the best time ever made across the Atlantic by a battleship. The trip has demonstrated that a ship of its class can maintain an average of more than 13 knots on a long voyage without injury to its machinery; that its coal carrying capacity is adequate for a trip of 4,000 miles under full speed, and that in time of war ships of this class can cross the ocean and engage an enemy at once. But for a few untoward happenings we would have come across in nine days. Our orders told us to go from Needles to Mount Desert Rock under natural draft. We did so. We had fair weather most of the way, but we encountered one gale, about a 50-mile gale, and had some trouble from fog and icebergs. We were obliged to slow down considerably on account of the latter, and one day averaged but about ten knots. We also lost a trifle of time in picking up the rock. The officers and men did their full duty and worked with a will. They were considerably tired, but if they had been given the orders they would cheerfully have steamed back again.



The Kearsarge

The Kearsarge arrived at Mount Desert rock in excellent condition, save that it was dirty, as we took on a deck load of coal on the superstructure deck and we had traces of that with us. We arrived just about the time I anticipated and so far as everything but coal is concerned could have turned around and gone back just as well and rapidly. We had 1,640 tons of coal when we left England; on our arrival at the rock there were 400 tons in the bunkers. This would be about enough to last four days under economical steam. The trip at that time of the year could have been made much more rapidly if we had been going from Mount Desert Rock to The Needles rather than the other way, as we encountered head winds, head currents and head seas. The Kearsarge was not in the best possible condition for a speedy trip across, as in the last 53 days we had steamed some 8,200 miles. We left New York, June 3, and went to England, then to Kiel and to Denmark, then back to England and home. Of this 53 days we spent 24 in port so that in 29 days we steamed on an average of nearly 300 miles a day.

Prospectors discovered by accident that 160 miles of the great Salt Lake nave been transformed into a fresh water lake by means of the great fill which is a part of the Lucin cut-off.

Recent discoveries on the coast of Maine prove conclusively that the early Indian inhabitants used to have clam bakes, cooking the clams just as we do now.

# Up Pike's Peak In An Automobile

## W. B. Felker Who Performed the Daring Feat Tells of His Experience--Highest Altitude Ever Reached by a Motor Vehicle

(By W. B. Felker of Denver, Colo., who Climbed Pike's Peak in a Locomobile)

Ever since reading about the failure of an attempt to climb Pike's Peak with a motor carriage I had wanted to try it. It was said that the road was impassable, and that it was an impossible undertaking. My companion, C. A. Yont, was a good photographer and engineer. The ascent is seventeen miles long, and the altitude reached is 14,147 feet. We left Denver Sunday morning, and steamed to Cascade, which is the foot of the pass and 86 miles from Denver.

It was 6 o'clock a. m., Aug. 12, when we started to make the ascent. We spent three hours in going the first two miles; the journey being over rocks and along ground made treacherous by numerous deep washouts. The Half-Way House was reached at 11 a. m. We thought that the worst part of our climb was over, but the lady in charge pointed up the mountain about two miles and said she was afraid we might have some trouble at Windy Point and on the W. From where we stood that W looked about as savage a piece of scenery as a crooked piece of lightning. I there took off my coat, crawled under the wagon and felt of every bolt and nut and piece of machinery about it. We nearly had a runaway directly after leaving the Half-Way House in crossing a bridge. Yont was kicked by a log thrown up by the whirling wheels, and when the machine jumped I was straightened out like a flapping flag. I hung on and managed to get the steam shut off. That was the worst bridge I have ever seen and I live in Colorado.

Grand View is what the name implies. If you get off the road a few feet you can drop 4,000 feet and not bump any on the way down. It is not necessary to put up any signs at Windy Point. Any one can easily tell when he arrives there. I understand that old Boreas got his start in business at this point. When you get above timber line there is no surface soil in sight.

Snow Banks in August

All rocks, from the size of a hen's egg to a box car.

When we reached the W we realized why the lady at the Half-Way House smiled when she said we might have trouble. Turn a letter W sideways and you have an idea of how it looks; but that doesn't give an idea of how you feel when you are on one of the points of the W about 13,000 feet up in the air.

About a mile from the top when everything but our spirits was high, one of these good old northwesters you read about, struck us. We put on overcoats and huddled about the fire box to keep from freezing, hoping it would blow over. We finally decided that it would be safer to climb up above it and get next to the sun again. This we did, but it was miserable, cold work. Our efforts were rewarded, however. The top side of a snow storm is not only better looking but more comfortable.

But the air is rare at 14,000 feet and hard to get. A few minutes tussel with a bad place in the road makes you think you have asthma, pneumonia and all kinds of lung troubles. We struggled to within 40 yards of the top when Yont succumbed to the altitude and lack of food. Pale as Vanderbilt's White Ghost and as shy of ambition as a Chinaman, he was flat on his back on the rocks. Teams never go up the last quarter of a mile, and the road was something fierce. Luckily a Mr. Bigger, of Cascade, came along and offered to go to the Signal station at the top and get food for us. With this help we rushed the last few rods and came bumping around the corner of the U. S. signal station in a cloud of steam. We stopped long enough to make pictures and food. It took three cups of coffee to thaw us out.

The return trip was perhaps more dangerous, but not such hard work. If our brake had given out, we certainly would have broken all records on the down trip, but would not have lived to claim the honor. We were tired and impatient to get down out of the clouds before dark, and so took many chances that might not have been exactly prudent. There seemed no limit to the abuse which our machine would stand. Coasting down hill on a smooth road is exciting but coming down a grade 17 miles long, pitched and tossed about like a small boat in a storm, is hard work. You get tired hanging on.

At the Half-Way House we lit our sidelights and came the balance of the way in the dark. We had gone over the road so carefully in the morning that we thought we knew every inch of it, but we found many bumps that we had missed going up. Our brake became so hot that we could smell the burning leather, and the metal parts could not be touched with the hand. We used about seven gallons of gasoline going up, coming down we use nothing but nerve. We had no horse to sympathize with, but we felt so proud of our auto that our feelings had plenty of exercise.

We reached Cascade at 9:30 p. m. We were too tired to stand around and brag much, and the way we hustled to bed made some of the summer resorters doubt that we had just taken our auto to the highest altitude ever reached by an automobile.

## HARMLESS BULLETS IN FRANCE.

A bullet that will not kill is a late invention in France, the country of bloodless duels. The bullet is made of wax and candle tallow sufficiently hard to retain form after leaving the pistol, but not hard enough to leave more than a grease spot on the clothing of the man at the other end of the range. In a duel, if one of the combatants is struck with a bullet, a little benzine will remove the scar, and the wounded man will have only the consciousness of defeat to bother him. This invention is likely to make the pistol supplant the sword in popularity in France as a medium for settling affairs of honor.

## URGES TECHNICAL SCHOOLS.

The Earl of Rosebery has written to the chairman of the London county council, submitting a plan for the establishment of a great institution for advanced scientific and technological education, at a cost of $1,500,000, toward which Wernher, Beit & Co., the well-known diamond firm, and others offer large contributions. A site for the institution has also practically been secured.

Lord Rosebery asks the council for an annual grant of $150,000 for the maintenance of the institution, upon securing which the whole scheme depends. In his letter submitting the proposal Lord Rosebery says:

"It is short of scandalous that our ambitious youths should be obliged to resort to the United States and Germany for technical training."

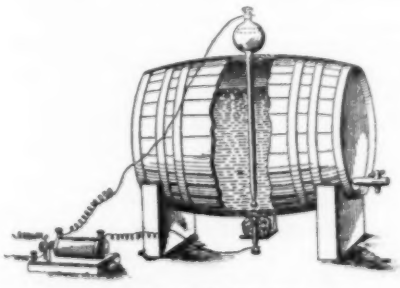
## WIND BREAKS FOR FAST ELECTRIC CARS.

The first electric road in the world to equip its cars with a device to break the resistance of the wind is the interurban line between Los Angeles and the ocean. The Street Railway Journal says the apparatus resembles the cow-catcher of a locomotive. The base of the structure is on a level with the floor of the car. From this point the knife-like edge extends upward at an angle of 45 degrees to the top of the car. The minor portions of the sides are rounded off in a convex curve to the sides of the car. The forward part of the structure will be constructed of glass, and it may be feasible to have the motorman sit in this hood, where he may control his car undisturbed.

To drive at a speed of sixty miles an hour a car equipped with this wind-break required 220 horsepower. Without the hood the same car, with its flat front, required 290 horsepower to attain the same speed. This is a saving of about 24 per cent of energy. At a speed of fifty miles an hour the test with and without the hood registered 137 horsepower and 170 horsepower, respectively. At one time the car attained a speed of sixty-eight miles an hour. The winds from off the ocean are very strong.

## ELECTRICITY IN BEER

Hereafter all the 40-rod lightning is not to be confined to rye and bourbon, for a system has been devised for sending an elec-



Electric Beer Preserver

tric current through a barrel of beer. The purpose, however, is to kill all germs and thus make the beer keep indefinitely.

The electric current passes through a spark coil and by means of wires is conducted through an electrode in the shape of a tube extending down into the beer. This tube is filled with an antiseptic. The other electrode is placed under the barrel and good contact secured by means of a wet sponge.

## HOW TO SQUARE THE CIRCLE.

To the Editor: Describe a circle which is enclosed in a square. Divide each side of

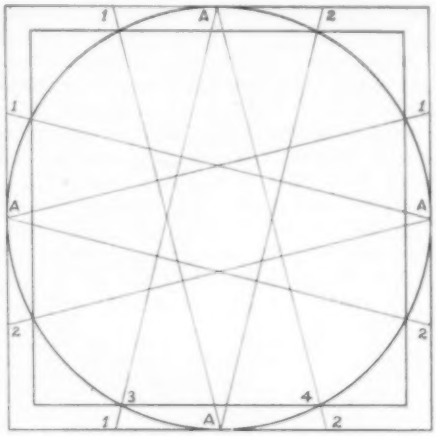



Diagram for Squaring Circle

the square into four equal parts. Produce lines from center of each side of square to one-fourth on opposite: see A 1 and A 2.

Where those lines cross the circle, see Figs. 3 and 4, draw another square which will be found to be the same area as the circle, or near enough for all practical purposes.

C. W. SHERWOOD

Racine, Wis.

## DR. KOCH'S RAT KILLER.

Prof. Koch has discovered a successful method for the destruction of rats which frequent the holds of ships. An experiment has been conducted on board the Bulgaria at Hamburg. The rats were placed in cages in the hold. An apparatus was then used to fill the hold of the ship with a gaseous substance. When this was concluded the cages were brought on deck and all the rats were found to be dead. The new system will in future be used in the German navy and also on the big German steamship lines.

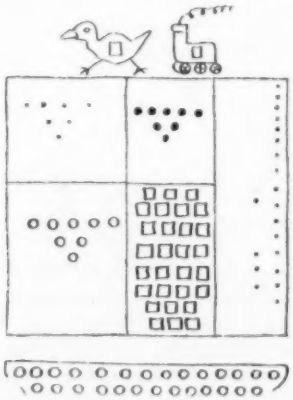
There are not enough steamers on the Ohio river to carry the immense amount of coal offered for shipment.

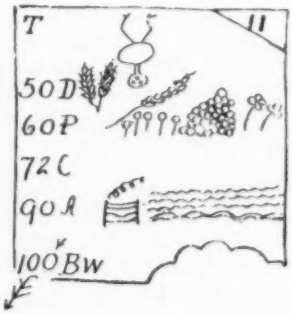
## HIEROGLYPHICS IN MODERN CLAY TRADE.

### System That Originated Three Thousand Years Yet Employed to Advantage

A remnant of ancient hieroglyphics is the system of phonography employed by the present-day brickmakers of South Devon in making their tallies. A similar system has been used by clay workers in different parts of the world since the time of Tothmes III 3,000 years ago. This system, it is said, is absolutely necessary to the work in the clay trade, and nothing else will take its place.

When a load of clay is sent away from the pit it is the custom to record the fact






on a piece of clay, using a prog for a pencil. This is called a tally. The tally, here reproduced, tells more than could be written otherwise in many times the space. It shows that there was sent from the brickyard, 8 loads of small, 8 large, 8 round, and 29 best square, twenty-one loads of small were sent to the siding, 27 loads of round to the canal for shipment; one load of square by the traction engine, and a local hauler, named Partridge had one load.

On the reverse side is shown that Pit No. 11 was out at 100 feet and the tally was written on a sample from the bottom of the pit. It further shows how many of the 77 shades and qualities of clay known to potters the pit contained and the depths at which they are found. A man named "Cutty," used for manufacturing tobacco pipes, 72 feet. There are lots of contradictory terms applied in designating different kinds of clay and clay products, as is shown in reading this "tally." "Pipe" clay, never used for pipes sanitary or smoking, but for nearly everything else under the sun, contained "flour" and "shot" mundic with "pin iron." The "drain," not an ounce of which is used for drain pipes but for jam jars, is "Corney." Between the "Alumine" at 90 feet and the "Best White," which is black as coal, but burns snowy white, there is "coal," that is, lignite and water. The figure denotes that here the strata varied.

A dash of "green" paint on the tally denotes that the "top" has the yellows; the teeth marks that the clay has been "tasted." The art of tasting consists of trying between the teeth to see if the clay is gritty. After tasting the tally is "fired," and the clay merchant has a record written on a table of stone. On the edge of the tally, which is an inch thick is a mark which indicates: "This clay will bear mixing."

It may be noted that the famous "blue ball" clay is the least blue of all the clays. "Round" clay is almost square. "Best square" is oval. "Small" clay is in large, irregular, tough masses. "Large" clay is a powder, but is used in the manufacture of large vases, etc. A ton in the clay trade is 2,540 pounds and is called a great tally, consisting of 70 to 74 "balls," which may be of any shape, excepting what is generally supposed to be ball shaped.

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The Union-Made Garment Makers' association at the Chicago convention decided to raise the price of overalls and other clothes for workmen, the raise being necessary, they claim, because of the increased price of cotton.

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Ten of the largest car wheel companies of the country are to combine to control the country's output.

# From New York To Buenos Ayres By Rail

## Carnegie's Great Project and the Country of Dormant Fabulous Wealth Through Which the Road Will Pass

By R. H. Field, of the United States Department of Agriculture

The time is past when the construction of railroads was looked upon as a hazardous enterprise, only to be undertaken in places where civilization is far advanced. Cecil Rhodes' scheme for a Cape to Cairo line affirms this; the Trans-Siberian railway proves it, and Carnegie's efforts for a continuous route from New York to Buenos Ayres brings the fact home with vital interest to the American people.

While it may be gratifying to national pride, and purses also, to know that the last enterprise is made possible by Yankee energy and capital, it is not in this continent where the most striking results will be noticed, but in the development of South America's internal resources. It will modify the political relations of the inland regions and be a benefit to Paraguay and Bolivia, the land-locked nations. It will stir into life the Matto Grasso in the most remote part of Brazil; the Parana lands, now entirely isolated; the Corientes and Misiones, now lost in the recesses of their forests, and will bring vitality to other sections. The United States, busy with home industries and taxed to the utmost to supply a growing trade across the waters, has left the commerce of this entire continent to Europeans; but now she not only opens a door comparatively free from competition, but into the heart of a region the most favored by natural resources of any on the continent.

South American Trading Boat

The result will be not merely a carrying away of these riches, denuding the forests and exhausting the mines, like drawing blood from an open artery, but the cultivation of the vast agricultural country in eastern Bolivia, Paraguay and Matto Grasso, the establishment of homes and the growth of cities.

In the southern part of Bolivia the road will be crossed by the transcontinental line from Rio Janeiro to Chili, now in course of construction; it is near here that the Paraguay and Maderia rivers have their sources in the same lagoon, making it possible for a canoe to go from Buenos Ayres, on the La Plata, to Para, on the Amazon.

The Brazilian government is taking steps to build a road around the rapids of the Maderia, because of the late trouble in Acre and a company has been formed to make a like connection with the heads of navigation on the two rivers where the Portugues started a canal in the last century, which will be the key to the greatest internal waterway in the world.

And right here might be mentioned a remarkable fact concerning this part of the country, toward which the four adjoining nations are striving to extend more direct means of communication; namely that the geographical center of the continent, the heads of navigation of two great rive systems, the converging of the three staple resources—mineral, forest and agricultural lands; the traject of projected railway lines, all fall within a radius of about 400 miles. Within this area the writer knows of a place on navigable water which divides a great agricultural plain from the mountains, where are found immense beds of manganese, anthracite coal, iron ore and good timber within a radius of 25 miles. The manganese has been tested in Sweden and pronounced of excellent quality, superior to the deposits in Spain which supply the Krupp foundries; the coal has been proven to be good, and the iron is of a high grade. As a depot for commerce the location is similar to that of St. Louis, and here is destined to spring

up the Pittsburg of South America. What a paradise for the fertile imaginations of promoters and developing companies who have controlled the current of immigration at will and built up cities in a night! How they will revel in the wild oranges, the tropical climate made healthful by altitude, the luxuriant forests abounding in cabinet woods and rubber trees, and the nearby gold and diamond fields of the adjoining Matto Grasso. Already Paraguay has left her terrapin policy and is offering free transportation, land, work-cattle, tools and seed to immigrant families from the agricultural districts of Europe; Brazil is putting forth every effort to make the Matto Grasso more accessable, while immigrants find a cordial welcome and prospects awaiting them in whatever country they land.

Another undertaking that will be of wide influence will be the railroad which is being pushed forward from the Pacific to navigable waters on the Amazon. It has already crossed the main ranges of the Andes. This will give the miners of Peru and Equador a direct outlet to the Atlantic and establish a transcontinental route for commerce.

## POWER REQUIRED FOR GRADE CLIMBING.

The accompanying tables, from the Moto Age, gives the approximate horsepower required to climb grades of from 5 to 20 per cent, at speeds of from 6 to 28 miles per hour, for a vehicle weighing 1,000 pounds. The angle as well as the per cent of the grades are given. The per cent of the grades is the number of feet of perpendicular rise in 100 feet. Thus a 10 per cent grade is a perpendicular rise of 10 in 100 feet. If the weight of the vehicle is under or over 1,000 pounds, multiplying the horsepower obtained from the table for the required grade and speed in miles per hour, by the actual weight of the vehicle and dividing the product by 1,000 will give the required horsepower.

| GRADE | | SPEED IN MILES PER HOUR | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Angle of Grade | Per cent | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 |
| 2° 30′ | 5 | 1.3 | 1.7 | 2.1 | 2.6 | 3.0 | 3.4 | 3.9 | 4.3 | 4.8 | 5.2 | 5.6 | 6.0 |
| 3° 30′ | 6 | 1.4 | 1.9 | 2.4 | 2.9 | 3.3 | 3.8 | 4.3 | 4.8 | 5.3 | 5.8 | 6.3 | 6.7 |
| 4° 40′ | 8 | 1.6 | 2.3 | 2.9 | 3.5 | 4.1 | 4.7 | 5.3 | 5.9 | 6.4 | 7.0 | 7.6 | 8.2 |
| 5° 40′ | 10 | 2.1 | 2.7 | 3.5 | 4.2 | 4.9 | 5.5 | 6.2 | 6.9 | 7.6 | 8.4 | 9.0 | |
| 6° 50′ | 12 | 2.4 | 3.2 | 4.0 | 4.8 | 5.6 | 6.4 | 7.2 | 8.0 | 8.8 | 9.6 | | |
| 8° 00′ | 14 | 2.6 | 3.6 | 4.5 | 5.4 | 6.3 | 7.2 | 8.1 | 9.0 | 10.0 | | | |
| 9° 10′ | 16 | 3.1 | 4.1 | 5.0 | 6.1 | 7.1 | 8.1 | 9.1 | 10.1 | | | | |
| 10° 10′ | 18 | 3.4 | 4.5 | 5.6 | 6.7 | 7.8 | 9.0 | 10.1 | | | | | |
| 11° 30′ | 20 | 3.7 | 4.8 | 6.1 | 7.4 | 8.6 | 9.8 | | | | | | |

Power for Grade Climbing

For example assume it is desired to ascertain the horsepower necessary to propel a 2,500 pound car up a 10 per cent grade at 20 miles per hour is found to be 6.9 horsepower. Then 6.9 multiplied by 2,500 and divided by 1,000 equals 17.25 horsepower. The horsepowers given in the table are, of course, only theoretical deductions and allowance must be made for road conditions and friction losses.

## THE TURBINE BOAT A SUCCESS.

### Inventor Believes It Will Revolutionize the Merchant Marine

The new turbine steamer Queen, which crossed the English Channel from Folkstone to Calais in 1 hour and 10 minutes, or at the rate of 23 knots an hour, has begun regular trips across the channel. The inventor, C. A. Pearson, will test a similar vessel in a trip across the Atlantic. He is confident the boat can clip a full day off the best transatlantic speed record. A notable feature of the Queen is that there are no vibrations save at the stern, where the second class accommodations are located.

The inventor is elated over the success of his vessel, and declares that the turbine is going to revolutionize the whole mercantile marine. "One great thing about the turbine engine," said Col. Denby, M. P., "is the difference in weight of the engine as compared with engines of the reciprocating type. With the same boilers there is much greater horsepower, and the coal consumption is less than that of the ordinary engine."

## WRITE BY TELEPHONE.

A machine by which one's handwriting may be transmitted by a telephone wire is the invention of E. Karl Gruhn, of Dresden, Germany, and is now being exhibited at an office on Broadway, New York. It is called the telechirograph, but it is in fact merely a greatly improved form of telautograph.

This instrument differs from telautographs in that the power required is much less than that needed for others doing the same thing. The machine also does not require the services of an operator wielding a stencil at the receiving end.

About 65,000 miles of railroad now center in Chicago, the railway center of the United States.

## PARIS PLANS BIG AUTO SHOW

### American Vehicles to be Seen—Proposed New Drome

American manufacturers are to be represented at the Sixth Annual Automobile Show to be held at Paris, France, Dec. 10 to 25. The exhibition will be at the Grand Palais, and will be under the main control of the Automobile Club de France, with the assistance of the various syndicates in the automobile and cycle trade. Gustave Rives as usual will be commissioner general. The best space in the center will be devoted entirely to the automobile exhibit and will be rented at $10 a square yard. Adjacent spaces will include automobile boats, ballooning, motor bicycles and various automatic devices of traffic.

The municipal council of Fontainebleau, France, proposes to build a long automobile course around a great forest. About $80,000 will be expended on the project. The route will be of tarred macadam, about 12 yards wide, fenced in for the entire distance.

The United States signal corps is preparing to erect a series of government wireless telegraph stations in Alaska.

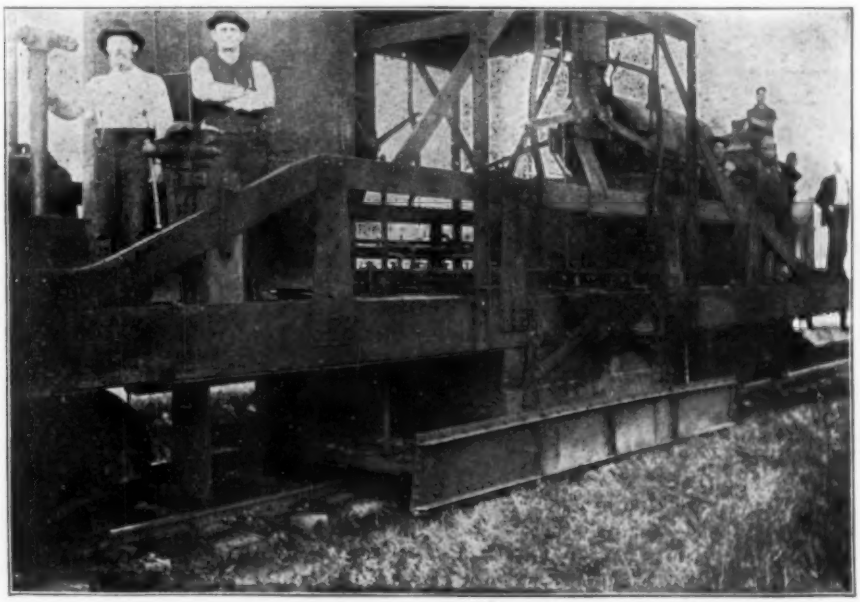
## CAR BURNS WEEDS FROM TRACK

### Fire Envelopes the Rank Foliage and Clears Roadway as Train Sweeps Along

Burning weeds from railroad tracks is a new method that has worked a complete transformation in the system of clearing the roads from such obstructions in the far west. A great weed burning car with a hot fire at its bottom sweeps over the track, and the weeds are left dead and wilted in its path. A second trip and nothing but the ashes of the weeds remain.

On some of the western roads, ballasted with natural dirt, the weeds often attained such an exurberant growth as to cover the rails and ties and hinder traffic. Clearing this from the track by the old method of hoe and spade was slow, tedious and exceedingly expensive. Until the weed burning car made its debut this problem was one of the most serious the roads in certain sections had to contend with. But now the task is simple and the remedy sure and speedy; besides the expense is reduced many fold.

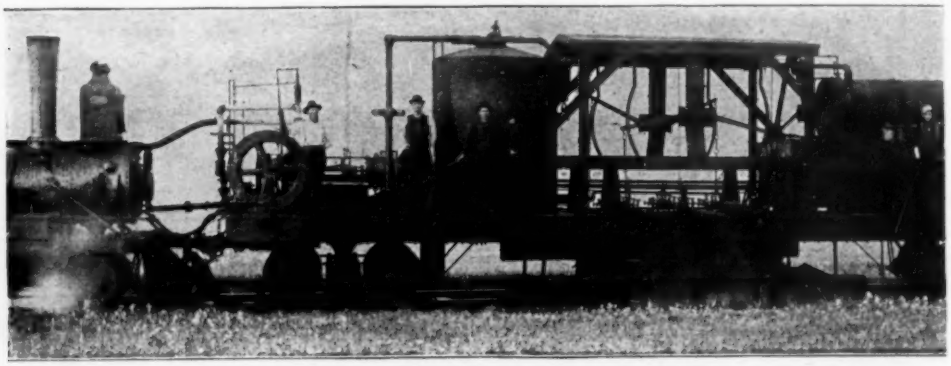
The fire pit opens downward, so that as the car moves along, the flame, blown downward by compressed air, completely envelopes the weeds along the track.



Near View of C., M. & St. Paul Ry. Weed-Burning Car Showing Fire Pit

The Railway Review says: "The fuel used is crude petroleum oil, which is passed through a curled-hair strainer, after it is taken from the supply tank, and then heated to a boiling temperature by coils of steam pipe. It is sprayed into the burners or combustion chamber by compressed air at 20 pounds pressure. To protect the heated fire brick from rain there is a roof over the center of the car.

When burning weeds, the oil is sprayed into the burners and the flame spreads over the track, underneath the highly heated fire brick. In dry weather the speed of operation is about four miles per hour, but in wet weather the progress is slower. The quantity of oil used is about one-half barrel per mile, and the expense of burning is $1.35 to $1.50 per mile, according to the conditions of vegetable growth and of the weather.



Showing Car in Process of Burning Weeds

These figures cover the entire expense for materials, labor and locomotive attendance. The weed-burning train carries, besides the burning car, an oil supply car (usually a stock car loaded with barrels of oil) and a boarding car for the crew. It will take care of 425 miles of track, with three burnings six weeks apart.

## TAKING PICTURES—KNIGHT IS RIGHT.

One of our readers, Mr. Geo. W. Knight, of San Marcus, Texas, writes: "Allow me to suggest to you and through you the correction of an error in all illustrated papers, to wit: Allowing everybody and everything to stare into, or at, the camera. See page 53, "Moulding Floor," et seq., for example. Instruct the camera man to have everyone attend to his own business—exceptions of course. The whole effect is generally destroyed when everything 'rubbers' at the camera."

He is certainly correct; but sometimes the pictures cannot be retaken, and when a contributor sends them in they are often not only the best we can get, but the only ones obtainable.

## JOKE ON TOM EDISON.

Edison abhors cigarettes. Recently one of his clerks dropped a package just outside the private office door. Next morning the offending box of cigarettes was found impaled with a nail, from which was suspended the following notice:

"A degenerate who is retrograding toward lower animal life has lost his packet."

There was no mistaking the familiar handwriting. It hung there all day.

Next morning the cigarettes were gone, but a big black plug of chewing tobacco was there instead. But not for very long.

Edison chews tobacco.

## PHOTO-TELEGRAPHY.

Korn's system of photo-telegraphy comprises a selenium cell, excited by the variations of light due to the varying density of the traversed photograph, and connected to the coil of a galvanometer. The needle of the galvanometer carries a contact which approaches or recedes from a fixed contact. The contacts are connected to line, and, at the receiving station, include a Tesla generator and a vacuum tube. The vacuum tube is enclosed so as to allow the variable radiations to pass through a small opening onto a photographic surface fixed on the interior of a moving cylinder.

## MAKES DEAD HEARTS BEAT

### Organs in Glass Case Made to Pulsate and Pump Blood as in Natural State

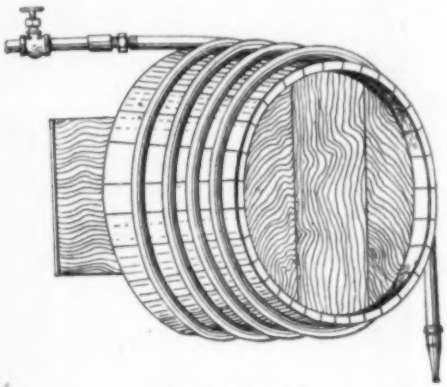
Hearts taken from bodies of dead animals, placed in glass jars and made to pulsate, as they did in the living animals, driving blood through glass tubes into the extracted lungs of the animals and into other receptacles especially provided for the purpose, were wonderful and seemingly unnatural sights witnessed a short time ago at the University of Chicago. The experiments were conducted by Prof. Elias P. Lyons in the presence of students. Most remarkable about the performance was that no artificial stimulants were used in making the glass-encased hearts beat and pump blood with life-like regularity. The heart is simply connected by glass tubing to the animal's lungs, all in open view through the glass. The chambers of the heart are then filled with defibrinated blood—blood from which has been taken the fibrin that causes it to coagulate. The fibrin can be removed without affecting in any way the chemical proportions of the blood. It is removed by simply stirring the cooled-off blood with a glass rod. The fibrin coagulates on the rod. When the blood is again placed in the heart, that organ resumes its pulsations. In order to keep the heart in motion the blood must be aerated. This is done by pumping air into the lungs or by allowing air to enter one of the chambers of the heart through an inserted tube. The professor is experimenting with the hearts of animals killed in the stockyards. In every case he finds that he can induce them to beat many hours after the animals have been killed, by removing from them the clotted blood and refilling them with thin blood. A few scientists claim that these experiments may be so far reaching in their results as to make it possible to cause the human heart to pulsate anew after natural death and so again put life into the body.

## ELECTRIC BASE FOR BASEBALL

A Canadian has invented an electric plate for the baseball diamond, which he believes will remove all doubt as to whether the runner or the baseman touches the plate first. To announce the result to those in the grand stand, the invention is provided with an electric bell, which the baseman can ring if he reaches the base first, and which the runner can prevent him from doing if he arrives first.

## TO PROTECT RUBBER HOSE.

It is not the water passing through it that wears out rubber hose, but the outside wear, especially the breaking which results from hanging it up. A butter tub arranged as



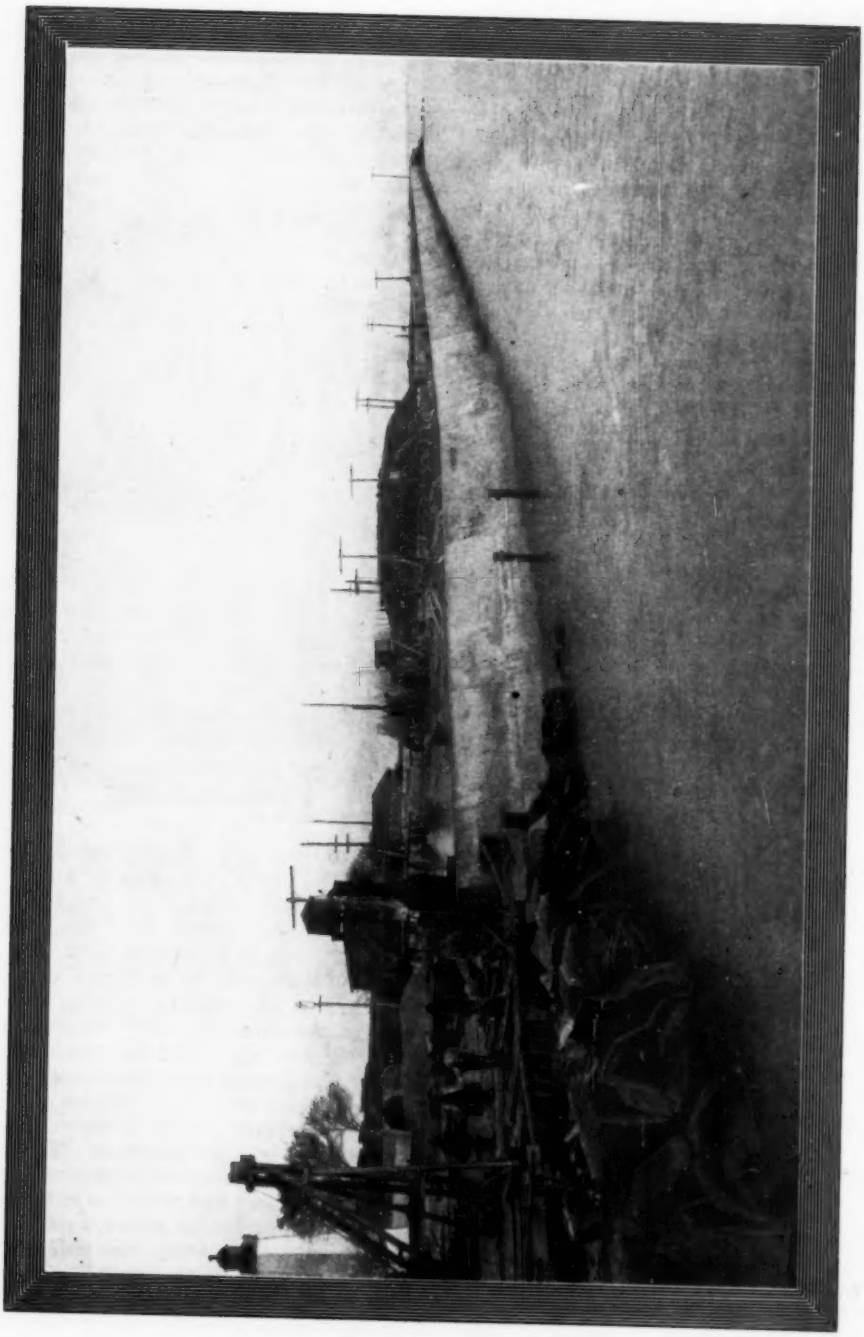
A Novel Hose Rack

shown in the illustration will save the hose when wound around it. Nail all the hoops on the tub and put an extra board on the bottom. The hose does not rest heavy enough in any one place to crush it.

## HOW TO RENDER BALL DRESSES INCOMBUSTIBLE.

French dyers and cleaners are sometimes required by their customers to make such articles as ball dresses and light summer garments incombustible. For this purpose take two litres of phosphoric acid, one litre liquid of ammonia, 20 grammes of borax, 25 grammes of sulphate of zinc, and 300 cubic centimetres of water. Commence by dissolving the borax and the sulphate each in half the quantity of the water. When these solutions are added together a turbid liquid is produced which becomes clear on the addition of the ammonia. The phosphoric acid is then added, and the mixture is ready for use. The article to be rendered incombustible is simply impregnated in this bath, wrung out carefully and dried.

George Shergold, who invented the safety bicycle, died a pauper in the public workhouse of Gloucester, England, last month at the age of 75 years.



Sea Wall---Fort Monroe

## NEW SEA WALL FOR FORT MONROE.

### Virginia's Historic Coast Defense Made More Formidable by Late Improvements

A new concrete sea wall has just been completed at Fort Monroe, Va. The wall, which is at the entrance of Chesapeake Bay, is of wonderfully substantial construction. Old Dominion Portland cement was used entirely in the work, as it stood the government tests in all respects. The work of sea wall improvement was in charge of Major James B. Quinn, of the United States Army Corps of Engineers.

Fort Monroe, replete with historic interest, has long been regarded as one of the most important coast defenses of the United States, and the new improvements that have been completed will add greatly to its strength and importance.

## LONDON SLOT MACHINE MAD.

Nowhere has the slot machine become so prevalent and reached such an advanced stage of perfection as in the city of London. So generally does it supply the wants of Londoners as to cause serious apprehensions on the part of shopkeepers. One company alone in London has in service half a million machines of 50 or more different types. In the railway stations there are machines which supply candy, biscuits, preserved fruits, tobacco, stamps, matches, briar pipes, cigaretts, cigars and soft drinks. There are in several stations automatic buffets, where all sorts of light refreshments and all sorts of light drinks, hard and soft, are vended by slot machines. There is one huge machine, called the automatic supply store, which aims to supply most human wants. It delivers pastry, small groceries, candy, tooth brushes, powder, drugs, tobacco, stationery, collars and cuffs, neckties, hose, soap, towels and a few other things. Another machine supplies umbrellas. You put 2 shillings (50 cents) in the slot in succession, press a spring and get a servicable and fairly good-looking protector from the rain.

But the most interesting of the machines put out so far is the poste restante. This is how it works: You have an appointment, say, with John Jones at Paddington station at 5 o'clock. You find that you cannot keep it, and it is too late to apprise Jones of the fact by telegraphing to his home or office. You can't send a messenger, for he probably wouldn't find the right Jones.

So you dispatch a telegram addressed "John Jones, Automatics, Paddington." The telegraph messenger delivers it to the machine, which exposes the address behind the glass. Jones, finding that you don't appear at the proper time, looks in the machine and sees the telegram. He gets it by putting a penny in the slot.

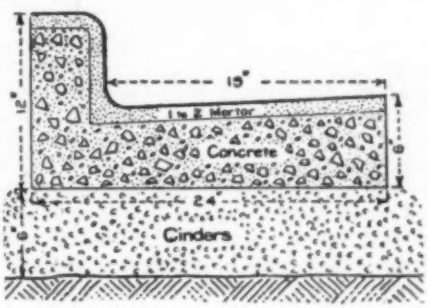
The disadvantage is, of course, that anybody can get anybody else's message by putting in his penny. But the British public seems willing to take a chance of that.

A new machine is about to be launched now which goes even further than this. It is an advertising automaton.

The increase in the number and types has led Mr. Labouchere to express the belief that shaving, haircutting, shoe cleaning, and art photography by slot machines must all come in time.

## CONCRETE CURB AND GUTTER.

The following is recommended by an experienced engineer as a satisfactory shape for concrete gutter and curb. A foundation of 6 inches of cinders is laid on which is




Concrete Curb and Gutter

placed the concrete, tamped down hard. The upper face is of mortar composed of 1 part cement to 2 parts fine sand. The dimensions are given in the illustration.

Experimenting with the X-ray in an endeavor to find a more important use for its mysterious light, Thomas A. Edison nearly lost his sight a short time ago, and Charles Dally, his assistant, was so affected by the light that one of his arms became paralyzed and had to be amputated. Mr. Edison was forced to give up the experiments.

## THE SIMPLON'S THREE EVIL CHARMS.

### Strange Phenomena That Hinder the Work of Digging Through the Alps

Three strange and mighty phenomena of uncommon kinds have acted almost like three evil charms to hinder the completion of the great Simplon tunnel in Europe. The peasants there have declared that the mountain gnomes and manikins are trying to fight the men who are boring a great hole through their sacred mountain.

The first strange occurrence was eighteen months ago when the blow of a pick broke into a tremendous subterranean sea that began immediately to pour out of the solid rock with a roar like that of Niagara. It swept away everything before it and hundreds of workmen were saved only by swimming with the rushing flood. At first the engineers expected that the water would run off within a few days, but days, weeks and months passed and the water was still rushing in undiminished volume, so that all the work was stopped.

At last a bed was blown into a solid rock and the waters turned into it. They are yet rushing through it, making a respectable river.

Scarcely had this danger been avoided before the tunnel began to slide and bend strangely. This was found to be due to rock that was so soft that it could not bear the pressure of the mighty mountain on top of it. Immense sums of money had to be spent to counteract this, and every new cutting has had to be surrounded with cement and concrete.

Before the engineers had more than finished their work over this phenomenon the Swiss end of the tunnel began to grow hot. Day by day the heat increased until it was so great that it blistered the skin of the workmen, driving them out of the cuttings. The costly ventilating appliances proved useless against this growing heat, that finally became too deadly to permit any human being to enter. Investigations proved that the heat was due to big accumulations of hot water that seeped through the rock in a thousand veins. Again the engineers had to call for immense sums of money to install new devices to fight the new enemy. They have succeeded, although it is still so hot in the tunnel that the visitor perspires violently as soon as he enters; the work is proceeding rapidly. And the hot water has been chained. It has been set to drive drills and other machinery.

## HOLDS TUMBLERS WHEN THE SHIP ROLLS.

An English inventor after having had a glass of water poured upon him while seated at table in a vessel crossing the English channel, went home and invented a device which cannot spill water from the glass. No matter how the ship rolls the

Cup That Will Not Tip

glass always maintains its level. The bottom of the frame, says the British inventor, is of rubber which acts as a sucker and will stick wherever pressed down on a smooth surface.

## CHICAGO TO BURN AGAIN.

### Red Light Fire From Building Tops in Commemoration of 1871

A pyrotechnical reproduction of the great Chicago fire is to be a feature of the Chicago centennial jubilee beginning Sept. 22. Five hundred tons of Roman fire will be put on roofs of the down town skyscrapers and on the tops of the larger buildings in the different divisions of the city, until the area covered by the fire of 1871 is included. The red fire on the different buildings will be ignited simultaneously and will burn for two hours. From the O'Leary home on Dekoven street, a long flight of bombs will memorialize the famous cow that kicked over the lamp starting the great fire of 32 years ago.

Popular Mechanics Want Ads give best returns for the money of any want column in America.

## THE NEW CARPET-CLEANING METHOD.

### Compressed Air Does Away with the Laborious Old Beating System

Rapidly is the old, laborious method of cleaning carpets passing into oblivion. The

Cleaning with Open Nozzleman

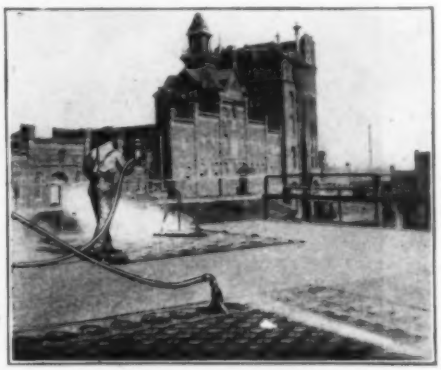
compressed-air cleaner is superseding the carpet beater. Aided by this new invention the work is done many times more thoroughly and in half the time. For an ordinary cleaning there is no need of taking up the carpets; but when a thorough renovation is desired the method illustrated is preferable. When the carpet is allowed to remain on the floor the compressed-air device sucks out the dust without any annoyance to the occupants of the room. There is no dust flying about the house, the nozzle and hose sucking it up as fast as it is loosened.

The cuts show the work of cleansing car-

After Carpet Has Been Cleaned of Most of the Dust

pets out of doors after they have been taken from the floor. Here the dust is being blown out. The air penetrates throughout the carpet, removing the dust from every fiber. The compressed-air cleaner is used for all kinds of tapestry and upholstery cleaning.

Compressed Air, the American publication devoted to the science of compressed air, says: "Experience, combined with careful study, has brought about an evolution in the line of renovating work as it does in all other things. After much investigation the conclusion has been reached that nothing is so harmless and at the same time so effective as compressed air in extracting dust and renovating carpets and hair mattresses."



Another Out-of-Door Method.

## PIG IRON SUPPLY SHORTEST ON RECORD.

According to reports from producers of pig iron in the United States, there is now in stock one of the smallest supplies on record. The weekly production from all furnaces during May is estimated at 395,406 tons, while the stock on June 1 amounted to but 204,892 tons. That is, the stock on hand was only about three days' production and less than five days' consumption.

A few years ago the American Warrant Company had in its yards 283,000 tons, which, at that time, was 25 per cent of the stock of pig iron in the country. At the present time this company has no iron in stock. Figures dwindled to 150,000 tons at the end of 1898, and to about 5,000 tons at the close of 1899. Since that time the expansion in the iron industry has been such that supplies have been absorbed by consumers, and in this instance, as well as in the case of producers themselves, the supply is extremely limited.

Popular Mechanics is written so you can understand it.

Great Boulder Bridge at Washington, D. C.

## BRIDGE BUILT OF BOULDERS

### New Span Across Rock Creek at Washington Remarkable For Its Size and Beauty

A master achievement in the building of boulder bridges is the new structure just completed in the National Park of the District of Columbia. This is the prettiest and largest boulder bridge ever built in America, and probably in the world. The enormous size of the boulders employed in the span adds to its interest. They are from five cubic feet to five cubic yards in dimensions. Old Dominion Portland cement was used exclusively in its construction. The bridge cost $17,500, and its building is another step in the effort to make Washington the most beautiful city in the world, as mentioned in previous issues of Popular Mechanics. W. J. Douglass, engineer of bridges, who supervised the work, says:

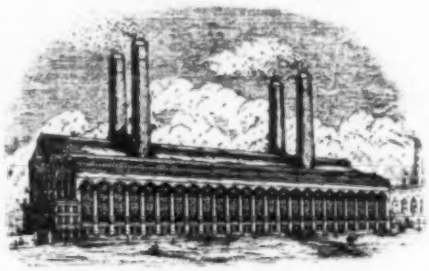
"The bridge spans Rock Creek and is a Melan concrete-steel arch, with an arch ring and spandrel wall facing of large boulders. The adoption of the boulder facing was determined by the character of the stream and the natural surroundings of the site. Rock Creek is aptly named. Its bed consists of rock worn into irregular boulder-like forms by the rapidly flowing water, and the hills which rise precipitately from its edges show large areas of weather-worn ledges, which in winter are bare of vegetation. Altogether the natural surroundings seemed to Captain Lansing H. Beach, then Engineer Commissioner of the District of Columbia, and a member of the Board of Control in charge of the National Park, to suggest a boulder bridge as particularly suited to the site, and the structure was, therefore, designed under his direction. As designed the bridge is unique because of its large span for a boulder bridge, and also because of the size of the boulders used."

## SOME ELECTRODE EFFECTS.

In electrolytic experiments two apparently equal platinum electrodes never behave alike; the same is the case with other metals. The disturbing factor appears to be the air, which is dissolved in the solution, and the presence of air dissolved in the solution seems to be of greater importance even than any air dissolved in the electrodes.

## BIG POWER STATION FOR THE UNDERGROUND ROAD IN LONDON.

One of the largest power houses in the world is nearly completed in London, for the new underground road—or tube—as the



Chelsea Station—Big London Power House

English say. It is being built by American engineers and the rapidity with which the work is pushed amazes the Londoners who are not accustomed to so much activity. The building is 453 feet long, 175 feet wide 140 feet high. It is built of brick and steel and will contain 80 boilers in batteries on the first and second floors. The engines will develop over 60,000 horsepower. The storage bins on the third floor will hold 15,000 tons of coal which is taken out of barges in the river alongside the building and elevated 140 feet to the top. The coal slides down by gravity to the boiler rooms and does not have to be touched. There are four big chimneys each 275 feet high and 19 feet in diameter on the inside. The road is being built by C. T. Yerkes, of Chicago.

## HOW TO RELIEVE PRICKLY HEAT.

Clinical Medicine suggests, since prickly heat is caused by the irritation from perspiration which can not readily evaporate, that it will be found better to resort to soap and water, used frequently, and to avoid alcoholic and alkaline washes. Once a day, perhaps, the irritated parts should be gently bathed, then dried thoroughly, and afterward anointed with cocoanut oil, which is absorbed readily, and should be applied with the hand. It is not greasy, and will not soil the clothing unless an excessive quantity is used.

Popular Mechanics is written so you can understand it.

# Where Clay Pipes Come From

## Little Town in Ohio Furnishes America's Principal Supply--How They Are Made

Maybe you have never heard of Mozadore. Few people have, yet it is a town that ought to be dear to all smokers of clay pipes. Mozadore is in Ohio. It is there that nearly all the clay pipes used by smokers in the United States are manufactured. The industry began there on a small scale 25 years ago and has grown until one of the largest manufacturing establishments in the country is now steadily engaged in making stone pipes. In the hills adjoining Mozadore is a peculiar kind of clay especially adapted to the making of these pipes.

The clay is ground in a clay mill until perfectly smooth, and then submitted to a piece of machinery which shapes the taffy-colored earth into long sausage-like rolls. These are cut up into two-inch bars or wads which are given to the men called "punchers," who, by placing them in a machine, form the shape of the pipe. The dexterity of the workmen in all the departments is wonderful. It is not unusual for a boy to make 16,000 pipes in one day.

The mining, grinding, running wads and punching is done by male help, but when the pipes leave the punchers table there are bits of ragged clay clinging to them. These are trimmed off by girls, called "finishers." The only tools required for their trade are a knife and a grain bag. The latter is fastened across the lap and after the pipe is trimmed with the knife it is rubbed across the bag until it is smooth. One finisher can smooth as rapidly as a puncher can make the pipes. When the pipes are partially dry they are placed in a sagger which resembles a straight butter pot with numerous holes punched in it, and then they are burned in a kiln about 48 hours. Shortly before the fires are allowed to go out salt is thrown in the fire to give the pipe its gloss. The kiln burning is a trade in itself and it requires considerable experience to temper the heat to the proper degree. It is the all-important part of the work for it is in the kiln that the pipe receives its color, gloss, smoothness and hardness. The cane for the stems is shipped from the Southern states and comes in bundles five feet long. The joints are sawed out on circular saws and the length made by little boys who run great risk of losing fingers. The next machine is also managed by boys who sharpen the edge of the stems. The stems are then subjected to an immense wooden cylinder, resembling a land roller, and rolled and whirled constantly which gives the stem a very respectable polish. Many of the stems are treated to the bending process. Long, regular rows of stems are placed on a grooved block of wood, and on the top of the hollowed part is a hollow iron tube, reaching across a row two yards long. A red hot iron bar is inserted in the hollow and in a few moments the heat will bend the cane the shape of the groove. This completes the manufacture of a stone pipe and stem.

## HOW TO USE CEMENT IN FROSTY WEATHER

While it is never best to use Portland cement during frosty weather, fairly good results may be obtained by using water in which salt has been first completely dissolved in quantities merely sufficient to prevent freezing, but care should be taken that the salt is thoroughly dissolved before the addition of the water to the sand and the cement, for, if mixed when not thoroughly in solution, or, if added dry to the mortar after that is prepared, it will crystalize in small bodies by itself, very seriously weakening the work into which it enters. One pound of salt to every 18 gallons of water when the thermometer is at 32 degrees F., and one additional ounce of salt for every further degree below 32 is a fairly safe guide in the use of this material.

If heated water is used it should not be added to the sand and the cement at a higher temperature than that at which the hand can be comfortably held in it. The materials used with the cement should also be moderately heated. Artificial heating of the water and the materials used with the cement, in the manner indicated, but only to the degree named, is very advantageous during frosty weather. Do not heat the cement itself.

If cement mortar or concrete can be kept from freezing until well set, no injury will result from use in frosty weather. If, however, the preparation is frozen before the set takes place, the work will be utterly valueless.

## MAY REOPEN MEXICAN IRON MINES.

It is reported that an effort is to be made to reopen some of the old iron mines in Mexico that have been abandoned since the seventeenth century. The mines were worked only to a very limited extent by the Spaniards with convict and slave labor. Great quantities of iron yet lie but a short distance benath the surface. The Spaniards were after copper and only took such of the iron ore as was most accessable with the crude machinery of nearly three centuries ago. The illustration shows the ruins of one of the old Spanish smelters near Fierro, Mexico.

Ruins of One of the Old Spanish Smelters Near Fierro, New Mexico

Camp and Plant says: "After being treated in the crude smelters the copper was carried by burro trains overland to the city of Mexico."

M. Santos Dumont has been invited by the French minister of war to make a military test of his steerable baloon with a view of using it in the French army. The test will consist of an attempt to leave Paris and enter one of the French frontier towns, Nancy or Belfort, the same day by air ship.

## STRANGE PLACES OF ABODE.

### Some People Live Among The Tree Tops—Others in Caves and Volcanic Craters

The inhabitants of Tupuselel need not travel far when they want to take a salt water bath. The town is built on piles which have been driven in a submurged coral reef far out in the Torres straits to the south of New Guinea. On the mainland, opposite this extraordinary settlement is another village that is perched high in the air among the gigantic palm trees with which the coast is fringed. The object of both communities in choosing these curious sites for their dwellings is identical. They desire to insure themselves against being surprised by their numerous enemies, and especially they seek safety from the prowling Dyak headhunters.

There are numerous other peculair places of abode. Many thousands of people of the earth dwell beneath its surface. There are human habitations in caverns where the light of day never penetrates and the craters of extinct volcanoes furnish shelter for hundreds. It was not long ago that a number of consumptives agreed to dwell together

within the dismal depth of Mammoth cave in Kentucky. Building material was carried into the cave and a tiny subterranean village sprang into existence by degrees. It was inhabited by thirteen families. But, the profound silence and eternal darkness outweighed the benefits of the pure dry air and the equable temperature which were expected to perform great cures. Some of the invalids died, others gave up the experiment in disgust and the houses so strangely and laboriously built are now given over to tramps.

Another colony of consumptives who, a few years ago, settled in the landlocked crater bay, which constitutes practically the whole interior of the volcanic island of St. Paul in the Indian ocean, have met with better luck than the dwellers in Mammoth cave. In this crater they are entirely protected against all wind no matter from what quarter of the compass it may chance to blow, while hot natural baths at varying temperature are always available. The very ground, too, is kept at a constantly equable heat by the latent volcanic fires within. And lastly food of all kinds is plentiful and varied and includes such curious and unusual delicacies as sea elephants' fins and tails. Now most of those who have been cured refuse to leave, preferring to remain on the island to returning to their homes.

## RAILROAD INTO NAZARETH.

### Shriek of the Iron Horse to Sound on the Shores of Galilee

The proposed railroad from Haifa, Syria, to the Sea of Galilee, began by the Thames Iron Company, of London, and abandoned eight years ago, is at last to be built. Apparently the railway has been purchased by the Turkish government which is to finish it, but it is believed that Germany is really back of the enterprise. The railroad is intended to reach Nazareth, the Lake of Galilee and connect with the road which the sultan has been so long building from Damascus toward Mecca. The vali, or governor of the province, has just unveiled a monument in commemoration of the resumption of work. Five German engineers are in charge and they are supposed to represent the Turkish government but in due time it will doubtless be shown that a German syndicate owns the property.

It will seem like sacrilege to run a railway into Nazareth, and the shriek of a locomotive will sound very strange on the shores of the sea of Galilee, but the world is progressing and beyond the Jordan is a great country which the Germans are determined to develop.

The sultan's railway from Damascus to Mecca has now been extended as far as the Dead Sea at a cost of about $2,000,000, but it is meeting with many oppositions and obstructions because of the hostile Arabs, who now levy blackmail upon all commerce and travelers. The poorest pilgrim is required to pay these Arabs a fee for their theoretical protection against robbers, although it is notorious that the only robbers belong to the same bands.

## INSTANTANEOUS PHOTOGRAPH OF AUTOMOBILE RUNNING 80 MILES AN HOUR.

A most remarkable photograph has at last been secured of an automobile moving at the tremendous speed of over 80 miles an hour. It is the first really successful picture

Photographed at 80 Miles An Hour

of the kind. The auto is being driven by Louis Renault and the photograph which had an exposure of only 1-2500th of a second says the Motor Age, was made by the Sigristi process. Note the curious malformation of the wheels, especially the forward one.

The coal famine last winter led to investigations by the Canadian government, with a result that nearly 100,000 square miles of coal fields have already been located. What there is in the far north is net yet known, but may prove very great.

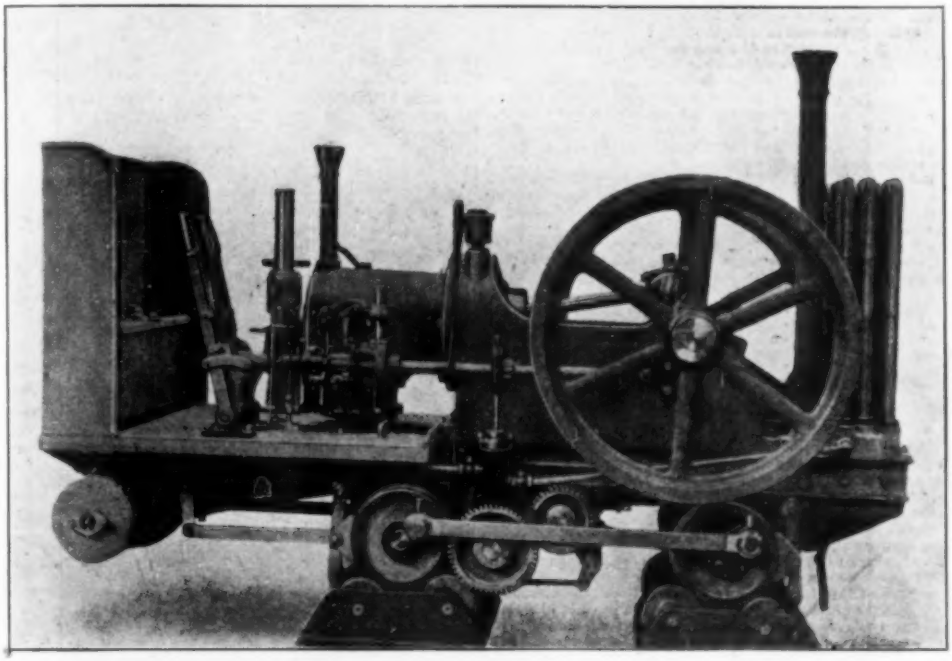
## JAPANESE LOCOMOTIVE IS A CURIOSITY.

A gasoline engine locomotive is now running on a Japanese railway between Atami and Odawara, a distance of 16 miles. The track gage is only two feet. The engine is only 12 horse-power.

Motion is communicated from the crank shaft to the first motion shaft by a Hans Renolds chain. This is on the far side of the engine, as shown in the engraving, and cannot, therefore, be seen. On the first motion shaft are arranged two speed gear clutches, designed to throw in or out gearing for speeds of either six or twelve miles an hour. A reversing clutch is fitted to the second motion shaft. The forward motion is brought about by gearing, and the backward motion by a Hans Renolds chain. The working levers are at the rear of the engine, as also is the hand wheel for applying the brakes. It may be seen behind the vaporizer chimney.

The cooling water is circualted by the small plunger pump seen below the center of the engine. This pump is worked by an eccentric from the lay shaft of the engine. The water is cooled in passing through the radiator pipes in front. The exhaust silencer is placed under the frame at the back of the engine. The petroleum fuel is carried in a tank fixed under the driver's seat. At the front, also under the framework, there is a sand box, which is operated by pedal gear by the driver.

In the engraving, which is reproduced from a photograph taken of the engine before it left the maker's works, the locomotive is shown mounted on the rools on which it was tested. The drawbars had not yet been put in place.



Locomotive Running on a Japanese Railroad

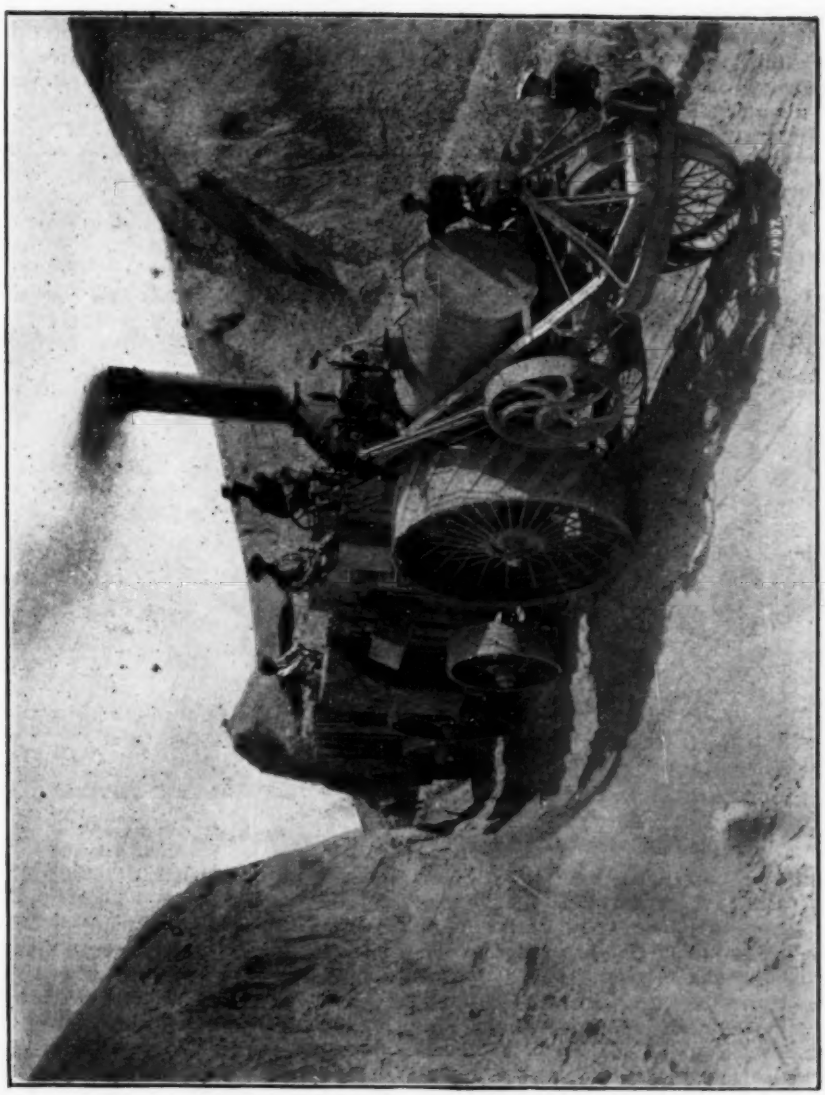
## HE WAS OUT OF FODDER.

Down in the Ozark regions of Missouri by some chance a newspaper strayed into a benighted neighborhood. The natives got hold of it and lost no time in finding a man who could read, all being anxious to hear the news. One man asked the reader:

"What are they doing down there in Washington now?"

"They are doing lots of things," the reader replied. "Congress has just passed a law adding two more months on to the year, and they are both winter months."

The questioner jumped from his seat, saying, "Geemmee, whiz! And I am just out of fodder."—Arkansas Globe.



The Traction Engine in the Mojave Desert—Conveying Calcium Borate

# Giant Locomotive on the Desert

## Modern Traction Engine Brings Fortunes From the Arid Lands of Mojave and Death Valley

The traction engine has invaded the desert. The land where no rain ever falls, where no vegetation ever grows, where the copper-colored sun hangs aflame all day, burning the sands to fiery heat, is at last to be made accessible to man. The thousands of waste acres in the far west are to be reclaimed from the desert chip-munks, lizards, sand frogs, coyotes and rattlesnakes, heretofore its sole inhabitants. Horses and mules fell dead in the air of fire, and until the traction engine rolled out upon the burning sand, the greatest difficulty was experienced in reaching the sources of vast wealth that lie in these arid regions. The sun does not hurt the traction engine, which can penetrate every part of the Mojave desert and Death valley. As a result new fields of wealth have been opened up and already great shipments of products are being made from the hitherto regarded impenetrable parts of these desert lands. Borax and salt in huge quantities are brought from out the strange regions and shipped to all parts of America.

In describing the traction engine used in this work, Enterprise says: "The traction engine is a giant in stature, from fifteen to eighteen feet in height, and is of the tri-wheel type, having two immense driving wheels over eight feet in diameter, and augmented by a smaller steering wheel located in front of the drivers. These huge wheels vary in width from 24 to 60 inches, the breadth depending upon the nature of the country to be traversed. They must necessarily be of extreme strength; the tires, manufactured of ⅞-inch open hearth steel, are supported from the massive hub by numerous steel spokes adjusted after the manner of a bicycle wheel. The axle is of six-inch steel, for, besides supporting the weight of many tons, the pulling tackle is attached directly to it, which assures the greatest tractive force at the least expenditure of power. The boiler is a modification of the vertical and horizontal, while the firebox is similar to that of the locomotive. Horizontal boilers were first employed, but were found impracticable in a mountainous country, and their use was superceded by one of a more equable tendency. Chain gears were utilized in some of the older types of engines, but because of their inflexibility they were discarded, and in the modern machines steel cog gearing is employed as more stable and enduring. By far the greatest achievement of this titantic automobile is the ponderous, yet delicate, steering apparatus, which is so nicely adjusted that a child can manipulate it. Twenty steel balls, ¾ of an inch in size, constitute the ball-bearing friction portion of the gear, and through its agency this bulk of animated steel is extremely tractable, its maneuvering being remarkable for such a ponderous mass."

### BET SEVEN LOCOMOTIVES AND HIS JOB.

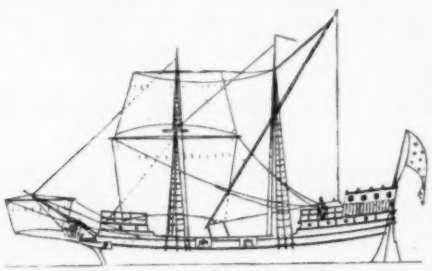
"Did you ever see a man in a poker game bet every cent he had on three aces? Well, that is what W. S. Carson, superintendent of Missouri Pacific terminals at Kansas City, did last June. But the stakes were bigger, probably, than were ever played in a poker game. He bet seven mogul locomotives and his job that the Missouri Pacific bridge wouldn't go out—this in the face of the fact that seventeen bridges across the Kaw had already gone. When Mr. Carson saw that his company's bridge was likely to go the way the others went, he took a desperate chance. He decided to weight the bridge down with mogul locomotives. Seven of them, representing a value of $125,000, were run out on the trembling structure. He knew, as did everybody else, that if the bridge went the engines would go with it, but he took the chance, and took it alone, for the city was cut off from communication with the other heads of departments, and there was no one to consult with. Had the bridge and engines gone, his job would have gone, and with it a large share of his reputation as a man of sound judgment. But the plan was a winner, and now his stock is away above par. He is in line for almost anything the company has to give."

The second longest telephone wire span in the world is 2,800 feet from pole to pole between Pasco and Kennewick, Wash. The longest, 3,200 feet, is across the Susquehanna river at Lancaster, Pa.

## FIRST SHIP ON THE GREAT LAKES.

### The Griffin Was Also the First to Disappear and Her Fate is Yet a Mystery

The Griffin, the first ship to sail on the Great Lakes of America, was also the first to be submerged among the long list of the lakes' sailing vessels, culminating with the Chicora, which with its burden of freight and passengers went out from Milwaukee a few years ago never to be heard of again. The Griffin was the boat with which the Marquis de La Salle explored Lake Huron and Lake Michigan. It was Sept. 18, 1679, that La Salle, remaining at Mackinac, sent the Griffin, with the pilot in charge, on the



Correct Rig of the "Griffin"

return voyage for the Niagara river. She carried a cargo of fine furs captured by the explorers.

After leaving the vessel La Salle and those of the band who remained behind traveled by canoe to the Illinois river on their voyage of discovery, but nothing more was ever heard of the Griffin or her crew or cargo.

Mr. R. P. Joy, a well-known marine writer, says the Griffin was built at Cuyagua Creek, about two leagues above Niagara Falls on the Niagara river, and was launched in the spring of 1679. She was somewhere between 45 and 60 tons burden and carried five guns. She had accommodations for 34 men. It is probable, says Mr. Joy, that La Salle obtained the designs for the vessel while in France, and that her rig was the prevailing rig for that period. On the mainmast were the triangular lateen sail, used then universally, and on the foremast the two square sails, also common on vessels of the time. As the triangular jig, or staysail, did not come into use until the early part of the eighteenth century, it is probable that the Griffin carried a spritsail on her high bowsprit. Even as late as the year 1750 the spritsail was common to all seagoing vessels, as many old prints will show.

The Griffin, with her hardy company on board, sailed out of the Niagara river on August 7, 1679, under command of La Salle. The vessel was navigated by an old salt-water seaman, who acted as pilot, and in four days the Detroit river was entered, and along its banks the members of the ship's company killed bears, deer and other game. Crossing Lake St. Clair, which La Salle named, and sailing up the St. Clair river, the vessel entered the broad waters of Lake Huron, where, when they were well at sea, a fierce gale nearly caused the ship to founder. "Even La Salle called on his followers to commend themselves to heaven. All fell to their prayers but the Godless pilot, who was loud in complaint against his commander for having brought him, after the honor he had won on the ocean, to drown at last ignominiously in fresh waters," but the vessel weathered the gale, and at last safely arrived in the harbor of Michilli, Mackinac, where there was a fur-trading settlement and Jesuit mission.

The Griffin, after a short stay at Mackinac, set sail for Green Bay, on Lake Michigan, and there, at one of the numerous islands, she took a cargo of furs, with which she set sail on her ill-fated journey Sept. 18, 1679.

## TWICE TWO NOT FOUR.

A story is told in Steam Engineering of a small manufacturer who was his own engineer with the help of a boy. He had ordered a new pump which was built to work under 100 pounds steam pressure. But it didn't work. The expert from the pump house spent a whole day taking it apart without finding the trouble.

"I can't find anything the matter with the pump," said the agent. "Let's see; this pump was ordered for boilers using how much steam?"

"One hundred pounds," replied the man who didn't need an engineer.

"Well, I'd like to look at your boilers. Where are they?"

"What's the boiler got to do with it?"

"Well, I would just like to see them."

"All right, you can see them, but I didn't send for you to examine my boilers. I've had 'em for twenty years and they are just as good as they were the day I got 'em. Here they are."

It needed but a glance to see what the trouble was. There were two boilers and the steam gages registered 50 pounds each.

# Champion Woman Swimmer An Inventor

## Miss Ada Lewin Delights the King and Queen at Swimming Exhibition

King Edward and Queen Alexandria of England and Others of the Royalty Viewing the Wonderful Feats of Ada Lewin, Noted Woman Inventor and the World's Champion Woman Swimmer.

Miss Ada Lewin, who won fame and favor in the international contest before the king and queen at London recently, is the inventor of several valuable mechanical appliances for the aid of amateur swimmers. One of these is a pocket life-saver, which can be carried in the pocket of a girl's boating costume and which can be quickly inflated and made ready for service by blowing with the mouth. King Edward was greatly pleased with Miss Lewin's feats at the swimming contest. She is said to be the champion woman swimmer of the world, and possesses unusual grace in and out of the water. She is an entertaining conversationalist and musician.

### SHRINKAGE OF CASTINGS.

Locomotive Cylinders—One-sixteenth inch in a foot.

Tin—One-fourth inch in a foot.

Pipes—One-eighth inch in a foot.

Zinc—Five-sixteenths inch in a foot.

Lead—Five-sixteenths inch in a foot.

Copper—Three-sixteenths inch in a foot.

Thin Brass.—One-eighth inch in 10 inches.

Thick Brass—One-eighth inch in 10 inches.

Bismuth—Five-thirty-seconds inch in foot.

Beams, Girders, etc.—One-eighth inch in 15 inches.

Engine-Beams, Connecting-Rods, etc.—One-eighth inch in sixteen inches.

Radium salts can be separated into two parts, one small but very active, and the other containing the greater part of the material, but inactive. Upon standing, the active part loses its radioactivity, while the other regains it, and this fact seems to indicate that the same set of molecules can not remain radioactive.

### BACK NUMBERS OF POPULAR MECHANICS WANTED—WHO HAS THEM?

We are anxious to secure several back numbers to complete a file for the librarian of congress. The missing numbers are as follows: Vol. 1, Nos. 1, 6, 7, 12, 13, 14, 16 and 18. Also Vol. 2, No. 1. Any of our readers who may have one or more of the missing copies are requested to advise us.

### AIR BRAKE FOR AUTOMOBILES.

One of the latest of auxiliary appliances for automobiles is an air brake. A small air pump worked by a cam on one of the axles forces the air into a steel compression tank. The pump is arranged to work automatically, ceasing action when the pressure rises above eighty pounds, and beginning when it falls below forty. The compressed air is also used for blowing a whistle and for inflating the tires.

## SCHEME TO MANUFACTURE GIANT GLACIERS.

### The Melting Ice and Snow Would Create Rivers and Reclaim Barren Lands

One of the most original and strange conceptions in a long time has possessed the mind of Dr. Woolridge, of Cleveland. He has studied for many years the problem of artifical rainfall and irrigation, and now proposes a scheme which is unique, to say the least.

He starts with the theory that if the warm, moisture-laden air of the Pacific coast could only be conducted to some high mountain top, and there released, it would instantly be precipitated in the form of rain or snow. The accumulated snows would form a glacier which, melting on warm days, would produce rivers which can be directed into barren lands and reclaim them. How to get the sea air to the mountain top is the problem, and this is how the doctor proposes to accomplish the feat, as quoted in the Irrigation Age. A great chimney or conducting flue should be built from the low coast lands to some mountain top. The doctor says: "My theory of creating a glacier has only grown from a close observation of the laws of nature. When warm air from the ocean's surface is carried in large volumes to great heights, clouds are formed and after an interval of time, because of pressure, rain falls. If, however, as has long since been discovered, the air from the ocean's surface rises slowly and is diffused and warmed as it rises the precipitation does not occur.

"This is exactly what happens in the lands I propose to irrigate by means of the glacier. And to wage a successful war against this law of nature it will be necessary to devise some scientific means of carrying the air which is now diffused straight up to a great height in a vast volume.

"The application proposed by the foregoing scientific truth is that a great flue will be built. The plan is that the entrance to the flue over the ocean's border should be twenty-one miles long, and under the deck or roof of this flue, which is supported like a suspension bridge, the height is 250 feet. This gives a trifle more than a square mile of area of cross-section at the entrance of the flue. The same area of cross-section is maintained throughout, the height increasing as the width of the flue diminishes, until where the constant width of the five miles is reached the height is one-fifth of a mile, or 1,056 feet plus the necessary allowance for the slack of suspension cables.

"This is relatively but little higher than the Eiffel tower, and the supporting towers within the structure may be trussed columns braced in all directions by steel cables rather than towers. This structure should be carried to the height of 10,000 feet on the San Bernardino range. As I have planned it it should be enclosed in glass set in steel sash, a large part of which is arranged to act as gravity valves to yield to storm pressure.

"Such a structure once built would take in the sea breeze throughout the whole breadth of its entrance, a larger volume of moist sea air than in the course of nature is often concentrated on any mountain tract of equal area to the San Bernardino heights, even when the heaviest precipitations on earth occur.

"When the air once starts to blow through such a flue, as it must as soon as enclosed, there is nothing in nature that could reverse the current; it would flow on forever as long as the flue remained. The cold produced by expansion would cause the moisture to be precipitated, not as rain, but in the form of powdery snow to be distributed over the heights, while the cold blast accompanying this snow would maintain it there unmelted until a great glacier would be formed."

## DRIED SUGAR BEETS—A NEW INDUSTRY.

The enormous production of sugar beets in Germany, which has been more than the refineries could use, has led the government to devise some means for making use of all the crop. The dried sugar beet is the result, and promises to reduce the importation of corn to an extent equal to the production of the new food. It sells for $1.19 per 100 pounds, is very nutritious and is used for stock in place of grain.

The Frankfurter Zeitung says the process, which seems to be a well-guarded secret, is a success and one factory alone has already produced 3,300,000 pounds the first season.

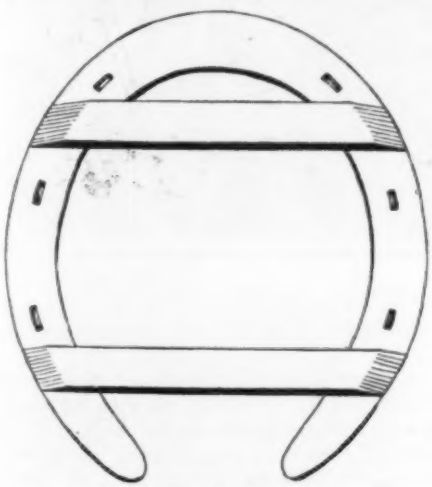
The most profitable mine in the world produces neither gold, silver nor precious stones. It is the Calumet & Hecla copper mine, near Lake Superior. In one year it cleared $10,000,000, and in thirty years has made for its owners $80,000,000.

## HOW TO CLEAN OILCLOTH.

The question is often asked, "Will it injure oilcloth to use ammonia on it? It cleans it so much easier than soap." Ammonia, or any strong alkali, should never be used on a varnished or painted surface. Alkalies soften and remove the paint or varnish. When oilcloth is very much soiled you can clean it with whiting made into a paste with soapsuds and rubbed on with a woolen cloth. Wash off with clear water and wipe dry.

## LATEST SHOE FOR TROTTING HORSES.

An Englishman while visiting at Memphis, Tenn., recently on a trip to study American trotting horses conceived a new idea in horse shoes and has named it the "Memphis." In our illustration from the Horse Review, the bars are placed 1⅛ inches from toe and heel. The American Blacksmith says the shoe used is just an ordinary one with two small, square steel bars welded on the top surface, one placed from one to two inches back of the toe and the other the same distance from the heel, clear across the shoe. The relative position of these bars determines the effect on the horse's action, and experiments have shown that different horses need the bars in different positions. Many Memphis trainers have tried these shoes and in no case have they been known to fail. It is rather remarkable that an Englishman should have solved a trotting problem that has so long puzzled American trainers.

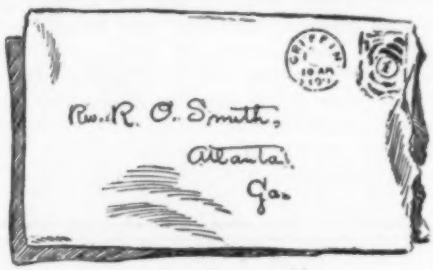


New Shoe for Racers

## SPECIAL DELIVERY BY CYCLONE.

### Remarkable Voyage of a Letter Through the Air

During the cyclone at Gainesville, Ga., recently a letter was delivered with great dispatch but in a manner not prescribed by the rules of the postoffice department. The missive had been placed in one of the little tin boxes that are seen in front of each farm house on the route of a rural free delivery. The cyclone arrived at the box ahead of the letter man, and picking up the letter carried it forty miles, where it was picked up, somewhat the worse for its experience, but still in a mailable condition, and so reached its destination safely.




Delivered by Cyclone

## GREATEST ORGAN IN THE WORLD.

According to the London Express, the greatest organ in the world has just been installed in the cathedral at Seville. It was built by a Spaniard, Senor Aguilino Amezua, and is of truly gigantic dimensions. There are four metal flute stops, each sixteen feet long, such as no other organ in Europe possesses. It is also the only organ which has bass-bourdons which give thirty-two vibrations a second and produce a deeper tone than the organ in Murcia, which has hitherto been the depest-toned organ in the world. There are altogether 200 independent stops and five bellows worked by electricity. The cost was $50,000.

## HARD COAL IN 1903.

If all the hard coal which will have been dug by the end of 1903 could be piled upon one heap it would make a mountain weighing 65,000,000 tons.

Just think of the ashes to carry out!

Popular Mechanics want ads always bring returns. Try one.

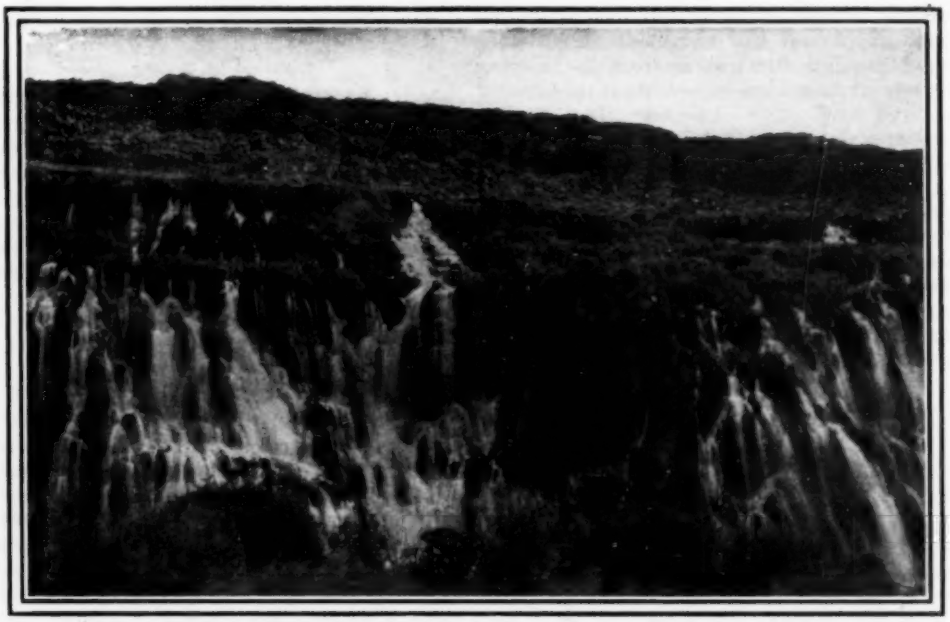
## ROBIN'S NEST MADE OF LACE.

Mrs. Newton, living in Center street, Geneseo, N. Y., put two fine lace collars out on the lawn in front of her house to dry a few days ago, and when she went to get them an hour later they were gone. She was sure no one had stolen them, because she was sitting beside a window at the front of the house at the time and would have seen any one entering the yard. The next day she put another collar out and watched. A robin flew down from an apple tree near by and carried off the collar. An investigation was made, and the other collars were found woven into the bird's nest in a crotch of the apple tree. There was also a small lace handkerchief in the nest. The bird that was doing the "fine art" nest building and its mate set up a big outcry and pecked fiercely at the man in the tree when the nest was being pulled down.

The contracts for the three new 16,000-ton battleships of the Vermont class have been awarded, the Vermont going to the Fore River Ship and Engine Company. This vessel alone will cost $4,179,000. The three vessels are to be completed in 42 months.

## GREAT BLUFF WITH A THOUSAND SPRINGS.

A thousand springs flow from a verdured declivity in Idaho, marking one of the most beautiful spots known to America. The place which is called "Thousand Springs," came into great public favor this season and proved an attraction for many tourists from America and Europe. The springs, large and small, burst from every crevice in the bluff, the water in some places joining into splendid waterfalls. No such scene as this can be found in any other part of the globe and those who viewed it this season wonder that beautiful "Thousand Springs" had not become famous before.



Thousand Springs, Idaho

## WOODEN WHEELS FOR AUTOMOBILES.

A wheel having wire spokes will sustain a greater weight than a wheel with wooden spokes of the same weight. The wooden spokes, however, will endure more harsh treatment such as side strain and running against curbs. The wire wheel is easily bent and broken, but the wooden one will still do duty even after several sopkes are broken out. The wooden wheel is likely to be the wheel generally adopted for the larger and heavier autos and for motor trucks.

## EDISON'S LATEST STORAGE BATTERY.

By Thomas A. Edison.

Popular impression seems to be that my new storage battery is more or less a possibility. One of them has been in operation the last three weeks on one of Altman's delivery wagons, and is doing all I expected or claimed for it. A great deal can be said of the new battery. All believe it will average more than a third greater mileage for half weight than will the old lead battery. An additional advantage is that it can be recharged at a much faster rate than the old battery. As much electricity as will send a motor forty miles can be put in it in less than an hour.

Ever since I took up this problem of a greater capacity battery I worked with the idea of using it for street locomotion in automobiles and trolleys, and an automobile battery was finished last Monday. Three friends and myself took a trial run to Atlantic City, the car consisting of a Morse frame and one of my batteries. We wished to attain great velocities over rough surfaces, and we succeeded beyond any of our expectations.

We cannot put the new battery on the market in any quantity as yet. The best we can do is to make one a day. By October we will make at least six daily, and about Christmas will meet any demand. This battery will drive all other methods of locomotion out of business.

## LATEST TYPE OF STEEL CAR

The latest type of all steel car is what is known as a hopper car, built to discharge its load of coal or ore through doors in the bottom. It is built of steel and will hold 100,000 pounds. The strength of the steel

50-Ton Hopper Car

plates, which are 5-16 of an inch thick enable the use of much lighter sills. The opening through which the load is discharged has 56 square feet, against 20 to 25 feet in the old style car.

## ENGLISH FIRE ENGINE MAKES THE LONGEST RUN ON RECORD.

### And Terrifies Dwellers in the Country Who Had Never Seen Such a Sight

With fire pouring from its stack and a mighty roar of steam and clanging of gongs, a monster steam fire engine dashed along the city streets and county roads in the

One Engine That Ran From London to Liverpool

longest run ever made by such a machine. All the way from London, where it was built, to Liverpool, where it had been sold, thousands of people gazed in wonder at the unusual sight. In the rural districts hundreds who had never before seen such a monster were terrified as it passed.

It was the trial trip, and a part of the test guaranteed by the builders, for the engine is a self-propeller which quickly leaves behind the strongest teams. On arrival at a fire the power of the engines is shifted from the wheels to the pumps by means of a friction clutch operated by a lever.

A French experimenter has made a discovery that should be of value in blueprinting by electric light. He has found that an arc lamp using carbons having a core of carbide of iron, will make blueprints and black drawings on white ground, or heliographic paper, three times more quickly than when ordinary carbons are used.—Machinery.

The Brooklyn bridge has lost place as one of the wonders of the world since the building of the Williamsburg steel bridge, a mile farther up the East river, and the bridge now building to Blackwell's island will be more wonderful than either.

## TO MAKE GRAPE JUICE AT HOME

### The Unfermented Product a Delightful and Healthful Beverage that Anyone May Have by Trying

By George C. Husmann, Expert in Charge of Viticultural Investigation, Bureau of Plant Industry, United States Department of Agriculture.

The uses of grape juice are indeed many. It is food and drink, refreshment and nourishment, all in one. Not a by-product, but made from fruit going to waste—one of the blessings given us, that some are too careless, others too ignorant, to make use of. It is used in sickness, convalescence and good health; as a preventive, restorative and cure; by the young, by persons in the prime of life and by those in old age. It is

FIG. 1.—Cloth and press.

FIG. 2.—Cloth or fel filter.

FIG. 4.—Drip bag

used in churches for sacramental purposes, at soda water fountains as a cool and refreshing drink, in homes, at hotels and at restaurants as a food, as a beverage, as a dessert, and in many other ways.

Fermentation of the grape juice may be prevented in either of two ways:

(1) By chemical methods, which consists in the addition of germ poisons or antiseptics, which either kill the germs or prevent their growth. Of these the principal ones used are salicylic, sulphurous, boraic and benzoic acids, formalin, fluorides and saccharin. As these substances are generally regarded as adulterants and injurious, their use is not recommended.

(2) By mechanical methods: The germs are either removed by some mechanical means, such as filtering, or a centrifugal apparatus, or they are destroyed by heat, electricity, etc. Of these heat has so far been the most practical. When a liquid is heated to a sufficiently high temperature all organisms in it are killed.

Here are directions for making the unfermented grape juice that may be applied in every home:

Use only clean, sound, well-ripened—but not overripe—grapes. If an ordinary cider mill is at hand, it may be used for crushing and pressing, or the grapes may be crushed and pressed with the hands. If a light-colored juice is desired, put the crushed grapes in a cleanly washed cloth sack and tie up. Then either hang up securely and twist it, or let two persons take hold, one on either end of the sack, Fig. 1, and twist until the greater part of the juice is expressed. Then gradually heat the juice in a double boiler or a large stone jar in a pan of hot water, so that the juice does not come in direct contact with the fire, at a temperature of 180 degrees F. to 200 degrees F., never above 200. It is best to use a thermometer, but if there be none at hand heat the juice until it steams, but do not allow it to boil. Put it in a glass or enameled vessel to settle for twenty-four hours; carefully drain the juice from the sediment, and run it through several thicknesses of clean flannel, or a conic filter made from woolen cloth or felt may be used. This filter is fixed to a hoop of iron, which can be suspended wherever necessary—Fig. 2. After this fill into clean bottles. Do not fill entirely, but leave room for the liquid to expand when again heated. Fit a thin board over the bottom of an ordinary wash boiler, Fig. 3, set the filled bottles (ordinary glass fruit jars are just as good) in it, fill in with water around the bottles to within an inch of the tops, and gradually heat until it is about to simmer. Then take the bottles out and cork or seal immediately. It is a good idea to take the further precaution of sealing the corks over with sealing wax or paraffin to prevent mold germs from entering through the corks. Should it be desired to make a red juice, heat the crushed grapes to not above 200 degrees F., strain through a clean cloth or drip bag, as shown in Fig. 4 (no pressure should be used), set away to cool and settle, and proceed the same as with light-colored juice. Many people do not even go to the trouble of letting the

juice settle after straining it, but reheat and seal it up immediately, simply setting the vessels away in a cool place in an upright position where they will be undisturbed. The juice is thus allowed to settle, and when wanted for use the clear juice is simply taken off the sediment. Any person familiar with the process of canning fruit can also preserve grape juice, for the principles involved are identical.

It should be remembered that attempts to sterilize at a temperature above 150 deg. F. are dangerous so far as the flavor of the finished product is concerned. Another serious mistake is sometimes made by putting juice into bottles so large that much of it becomes spoiled before it is used after the bottles are opened. Unfermented grape juice properly made and bottled will keep indefinitely if it is not exposed to the atmosphere or mold germs; but when a bottle is once opened it should, like canned goods, be used as soon as possible to keep it from spoiling.

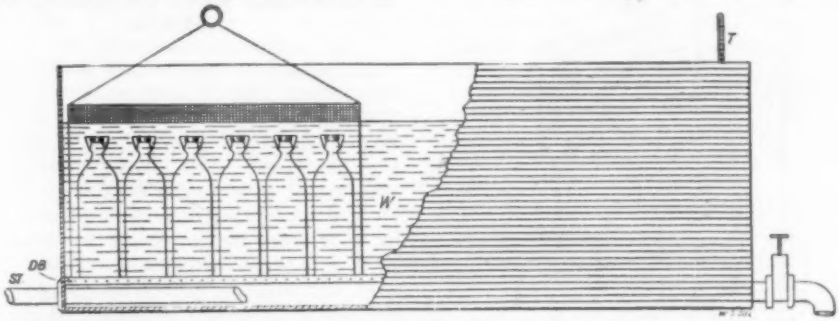



FIG. 3.—Pasteurizer fo juice in bottles: *DB*, Double bottom. *ST*, Steam pipe. *W*, Water bath. *T*, Thermometer. (Bottle shows method of adjusting a cork holder of sheet metal.)

## TO SHORTEN A GLASS GAGE TUBE.

If a glass gage tube is too long, take a three-cornered file and wet it; hold the tube in the left hand, with the thumb and forefinger at the place where you wish to cut it; saw it quickly and lightly two or three times with the edge of the file, so as to mark the glass. Now take the tube in both hands, says Steam Engineering, both thumbs being on the opposite side to the mark, and about an inch apart; then try to bend the glass, using your thumbs as fulcrums, and it will break at the mark, which has weakened the tube.

The Manila cable was completed and used for the first time on July 4, when President Roosevelt sent the first message around the world.

## HOW TO RID A GREENHOUSE OF INSECTS.

Where the ordinary spraying and tobacco smoke have failed to accomplish their purpose, the Florist's Review tells how to effectually rid a greenhouse of every form of animal life. As the chemicals to be used are extremely poisonous, and the gas or fumes arising from the mixture equally so, the work should be done only by an adult, and then with great care. This is how it is done:

First close all the doors and windows to make the place as nearly air tight as possible. Then take five ounces of cyanide of potassium, one quart of sulphuric acid and one quart of water. Mix the sulphuric acid and water in a gallon butter jar. If the jar is even larger, so much the better. In a few minutes drop in your little parcel of cyanide done up in two thicknesses of paper, so that the acid does not reach it too quickly. Use this quantity for 2,000 cubic feet of air space in your house and keep the house closed all night. The plants will not be injured. Don't linger over the jar after you have dropped in the cyanide; remove all favorite cats and canaries and let the rats and mice take care of themselves.

## ROAD REPAIRS TO LEAKY PIPES.

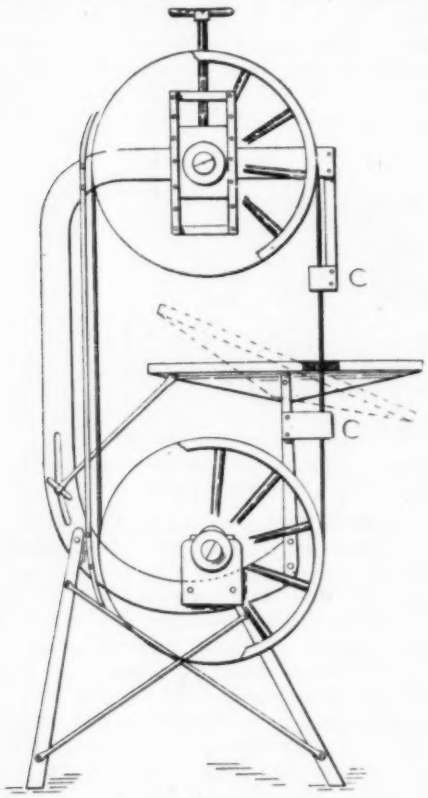
Leaky joints in gasoline or water pipes may be made tight by means of coarse linen or canvas ,covered with a paste of litharge and glycerine. This should be again covered with a bandage of adhesive or sticky tape, such as is used for electrical purposes.—Motor Age.

A new rubber plant which grows underground has been discovered in Africa.

# SHOP NOTES

## HOW TO MAKE A HOME-MADE BAND SAW.

The band saw shown in the cut was made by using an old plow beam, a smooth one, for the back, says a writer in the American Blacksmith. The legs are cultivator beams, the screw tightener was taken from an old Jones' binder and the two




Home Made Band Saw

wheels are out of a press drill covered on the rim with rubber tires. The guides are simply made of brass with slots for ¼, ½ and 1-inch band, and they are cut in so that the saw will fit as shown at C. This saw will cut up to 9-inch stock. The table of course should be so constructed as to tilt to allow a bevel to be cut. This makes a useful machine and an inexpensive one.

One factory in Connecticut makes ten miles of chain a day.

## HOW TO DRILL THROUGH GLASS.

A method of drilling through glass is as follows, says the Engineer: A piece of copper tube is cut off with square end, and the other end fitted with a shank which will enter the drill spindle. The glass is then placed squarely on the drill table, and emery powder and oil are fed under the copper tube. The tube should be raised frequently and fresh emery and oil fed in, so that the cutting edge will be kept smooth and in good working condition.

## TO PREVENT RUST ON METAL INSTRUMENTS.

For keeping tools bright and free from rust when out of use, says the "Medical Times," brush them with a preparation made by stirring enough red or black mineral paint into crude petroleum to make the mixture of consistency easy to spread. This can be applied with a brush made of a piece of sheepskin tanned with the wool on, or with any ordinary brush. It will prevent rust, and may be rubbed off readily, leaving the face of the tool perfectly bright.

## HOW TO MAKE FLOOR VARNISH.

An excellent floor varnish may easily be prepared by dissolving a pound of spirit copal gum, a pound of gum sandarach and one-quarter pound of shellac in methylated spirits, a gallon, afterward well stirring into the varnish one-quarter ounce of carbolic acid. It may be prepared in a variety of shades by adding any of the aniline dyes soluble in spirits or may be colored as follows: For mahogany add to the above five ounces bismarck brown; for light oak, dark oak and walnut add dry vandyke brown in variable proportions. Before applying the varnish, says the Decorators and Painter's Magazine, the floors should be given a coat of glue size, which must be allowed to thoroughly dry; then apply the varnish quickly and evenly with a fine brush. These varnishes dry hard and sharp, with an excellent gloss, and are quite durable when submitted to heavy usage. They are also useful as disinfectants, as they destroy all living matter that may exist in the dust which so often accumulates on floors.

## REMOVING PULLEY—GAGE FOR ROUND HEAD SCREWS.

In each instance the illustrations from the Engineer tell their own story. The first shows an easy method of removing a tight

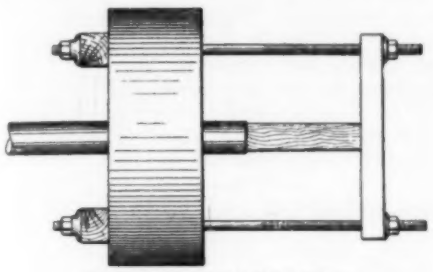
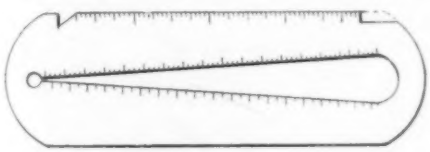


Fig. 1.—Removing a Tight Pulley

pulley from the shaft of an engine, motor, or generator.

The other is an extra notch that can be put in a screw gage so as to measure the



Extra Notch in Screw Gage

length of round head screws as easily as that of the flat head.

## AIR IN "BLIND" HOLES.

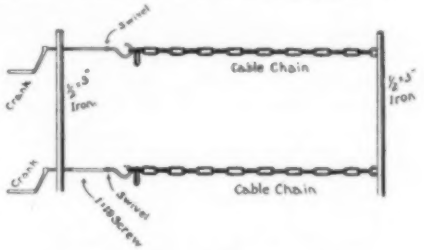
If an ordinary stud be screwed into a "blind" hole, there will be a certain amount of air trapped and compressed in the hole by the stud as it is forced in, says Compressed Air. Now, the pressure of this compressed air acting on the stud is liable to loosen it and cases constantly occur of loose studs from this cause; to avoid this it has been suggested that a groove be cut along the threads so as to leave a small air passage just below the threads; up this the air, or oil used for lubricating the tap, can pass. A similar thing takes place in case of covered nuts, so that it is possible to take similar steps to stop the action. In the case of small ones a groove up the screw as described would do, but in the case of large nuts, such, for instance, as are used for securing the propeller on the shaft of a screw steamer, a hole is usually drilled in the top of the nut, and a screw fitted to the hole to maintain the water-tightness of the cap. Where the bolt or shaft is horizontal it is better to have the hole near the edge, and, after tightening the nut up, to fill the hole with soapy water and replace the small screw. By having the hole at the edge it is evident that it can be turned up so as to be at the highest point for all the air to be driven out.

## HOW TO BEND THIN COPPER PIPE.

Fasten two thick pieces of hard wood together with a space between them. That will allow the pipe to be bent to be inserted without forcing, says the Metal Worker. In between the two pieces of hard wood put a form of the diameter of the desired circle. Fill the pipe with sand and plug the end securely. The sand on the inside of the pipe will prevent choking in the throat, and the hard wood on the outside will prevent the pipe spreading on the sides to a larger diameter and taking an oval shape. These wooden forms may be held securely in a vise or may be bolted to a bench or trestle.

## CONVENIENT DEVICE FOR THE STEAM FITTER.

A very convenient device for a steam fitter to carry in his tool chest would be two double clamps connected with a cable chain, says Domestic Engineering. The hooks on the end of the screws should be made to engage in the links on the chain at any point desired. These hooks are arranged with a




Handy Device for Steam Fitter

swivel and by placing this device at the top and bottom of the radiator, opposite the nipples, above and below the radiator bolts, the sections can be readily drawn together and the bolts tightened with little or no trouble. The accompanying sketch explains the device.

Isn't it about time the motor hearse made its appearance? It would probably be the first time some people ever rode in an auto, and it certainly would be their last chance.

## HOW TO MAKE FURNITURE POLISH.

To make a cheap and excellent furniture polish take one ounce of white wax, one ounce of castile soap, one-half pint of turpentine, two ounces of beeswax, one-half pint of soft water. Dissolve the white wax and soap, which must both previously be cut into fine shavings, in the water on the stove and dissolve the beeswax in the turpentine. When nearly cold mix these ingredients together and the polish will be ready for use.

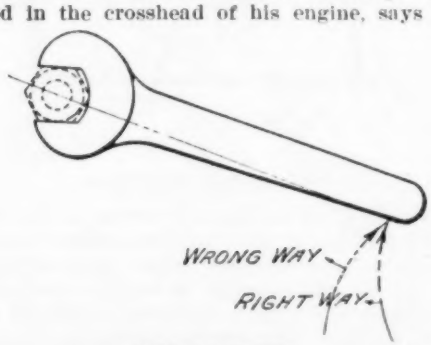
## LEAD GASKETS FOR PUMP VALVES.

Some time ago I had trouble with the rubber ring gaskets which make the joints under the valve caps of a 12x6x12 outside packed plunger pump, says a writer in Power. This is a boiler feed pump and works against a pressure of 165 pounds, and you can see that with a hot well and economizer and also a heater, the water which the pump handles is very hot, and a good gasket is required.

I took a piece of sheet lead, about 1-16 inch thick, and cut out of it a ring 3⅝ inside diameter and 4⅜ outside diameter. I used these as gaskets to make over each joint, and since then there have not been any gaskets blown out. This was over eighteen months ago, and it looks as though a shut-down would have to be from some other reason than blown-out gaskets.

## HOW TO STRIKE THE WRENCH.

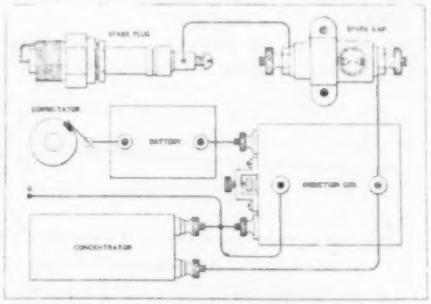
Not long since I called to see an engineer friend of mine and found him trying to slacken the nut which secured the piston rod in the crosshead of his engine, says a writer in Steam Engineering. There was very little room for manipulating the wrench between the guides, so in order to start the nut the handle of the wrench had to be struck with a sledge hammer. The man who was assisting the engineer evidently did not understand how to handle the hammer, for not one of the blows had the desired effect; not that the blows lacked force, but simply because the wrench handle was struck at an oblique angle, so that the full force of the blow was not effective, as it would have been had the sledge struck the wrench handle fairly at right angles to its length. The engineer, who was holding the wrench, saw that something was wrong, and at once changed places with his helper, with the result that about two properly directed blows loosened the nut.




Striking a Wrench

## CONCENTRATOR FOR JUMP SPARK SYSTEM.

One of the latest applances in the auto line is the King concentrator for increasing the efficiency of jumps park systems of electric ignition. This concentrator is placed in parallel with the secondary circuit in connection with a spark gap, and serves as a secondary condenser to increase the efficiency of the spark, says Motor Age. The illustration shows diagramatically how the concentrator is placed in the circuit. It is made in pattern for motors of from one to four cylinders and it is claimed that it is well insulated and puncture proof. It is supplied with a directly connected spark gap when desired, or without it if to be used in circuits already supplied with the extra gap.




The King Concentrator

## WATER FOR CONDENSING ENGINES.

Condensing engines require from twenty to thirty times the amount of the boiler feed water, for condensing purposes. An approximation, for estimating purposes, is one and one-quarter gallons condensing water per minute per indicated horse power. It is usually estimated that a condenser will decrease the fuel consumption by from twenty to twenty-five per cent.

## HOW TO PRESERVE PAINT BRUSHES.

Paint brushes are expensive, and in the course of a year as many brushes are ruined by misuse as by actual wear in many shops. Especially is this the case where the brushes are not in constant use. A writer in the American Blacksmith recommends the brush keeper shown in Fig. 1, which has three compartments and can be locked. This box is large enough to

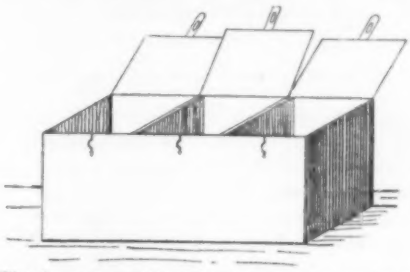


Fig. 1. A VERY CONVENIENT BRUSH KEEPER.

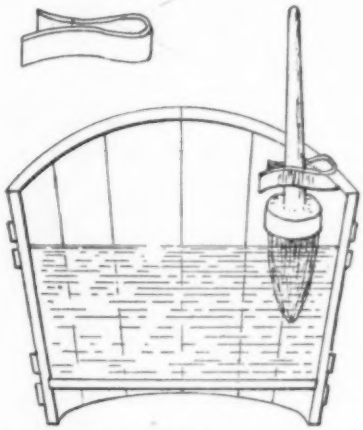


Fig. 2. THE PROPER WAY OF KEEPING BRUSHES IN WATER.

take care of three full sets of varnish brushes. Have the box made of tin at any tinshop.

For the ordinary paint brushes, bristle brushes for applying priming, lead and rough stiff brushes, etc., there is needed a device for holding the brushes in suspension in water. The practice of many painters of dropping the brushes into a pail containing a greater or less quantity of water and allowing them to rest upon the points, very soon puts a brush out of proper condition. It gets misshapen, loses its "hang," and elasticity, and presently becomes an expensive tool to handle. Fig. 2 shows a section of a paint brush keeper that needs only a cover to make it practically perfect for holding the class of brushes referred to. Bend a piece of spring steel to the shape illustrated, and then drive it into the staves of the pail as shown and you have a device that holds the brush securely and without injury to any part of its composition. These pails may be bought at confectionery or tobacco stores for five cents each. Change the water every other day at least, in order to insure pure, clean water, which latter will add length of days to the life of the brush.

## A FILE FOR BRASS.

The Mechanical Review describes in one of its recent issues a new type of file, especially devised for working upon gun metal that has been introduced into the engineering department of the Chemin de Fer du Nord, France. The feature of this tool which distinguishes it from the general type of file is a series of shallow channels which cross its face diagonally at an angle of 30 deg., and placed about half an inch apart. The raised portions of the surface of the file between these channels are occupied by the teeth of the tool. The advantages of the file are that it clogs less rapidly, and can easily and quickly be re-sharpened on the sand blast, while it increases the work of the engineer who uses it in connection with gun metal filing by 30 per cent.

## GOLD FISH CAUGHT IN NEW YORK.

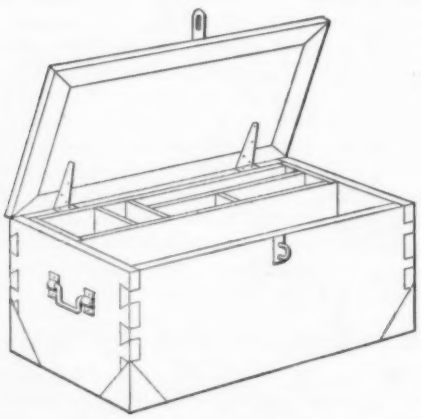
Few persons are aware that most of the goldfish sold in the United States, excepting those bred in captivity, are caught in the streams of New York state. Two ponds in the City of Brooklyn furnish thousands of them every year. They are caught by the children with crooked pins and twine for fishing lines. There was once a pond in what was known as Bay Ridge that was full of goldfish, but this is now covered with buildings. In the Cotton watershed and in the Bronx many thousands of them are caught every year. The lakes of Central Park and Prospect Park swarm with them, but there they are not permitted to be molested. The fish are generally caught by using bread for bait. It is known that goldfish originally came from China and it is regarded as somewhat of a mystery how they should have come to so populously inhabit the water of New York state.

## STEAM FITTERS' TOOL CHEST.

### Is Handy, Easily Made and Provides for Every Emergency

The tool chest herewith described is made of sound stock lumber 1¼ inches thick and is designed to hold a complete set of steam fitters' tools. The outside measurements are 39½ by 20 by 15½ inches. The chest should have three keys and locks. The hinges, and corner pieces, should be riveted on and the corner irons should be set in flush. Fig. 1 shows a general view of the tool chest with lid raised. Fig. 2 is a cross section and Fig. 3 is a plan of the top tray, with the compartments numbered. Mr. H. C. Blair of Coon Rapids, Ia., who describes the chest in the Metal Worker, says:

In compartment No. 1 I keep oil cans for oil and gasoline. In No. 2 I keep an 8-inch Stillson wrench, an 8-inch monkey wrench, a



Practical Tool Chest. Fig. 1.—General View

calking tool, cold chisel, center punch, plumb bob and wire cutters. In compartment No. 3 I have bushings for dies, from ⅛ inch up to 1½ inches, inclusive. In compartment No. 4 I have one 18-inch Stillson wrench, an 18-inch monkey wrench, one pair each of ¾, 1 and 1¼ inch pipe tongs, one 3-16 x 20 inch feeling bit, one pointed chisel, one chalk line, one ⅜-inch bolt die, and one pair of 10-inch gas plyers. In compartment No. 5 I carry a key-hole saw, a heavy hammer, a claw hammer, a 6 and 12-inch screw driver, a ratchet brace and a tape line. In compartment No. 6 I carry one set of twist drills, a ¼ and a ⅜ inch bit, one extension bit, one ⅜-inch ship auger, a 12-inch flat file, a triangular file, a wood chisel, a gauge, a combination pencil and divider, a glass cutter and a brush for red lead.

In compartment No. 8, shown in Fig. 3, which is a plan of the bottom part of the

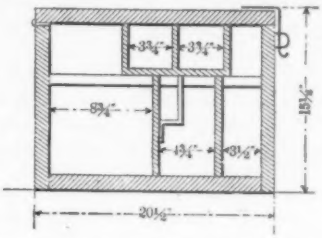


Fig. 2.—Cross Section Showing Compartments

chest, I carry a set of nipple holders, from ¼ to 2 inch, inclusive. In compartment No. 9 I carry one 24-inch Stillson wrench, one pair each of 1¼, 1½ and 2 inch tongs, and also have a No. 1 and No. 2 pipe cutter. In compartments No. 10, 11, 12 and 13, I have

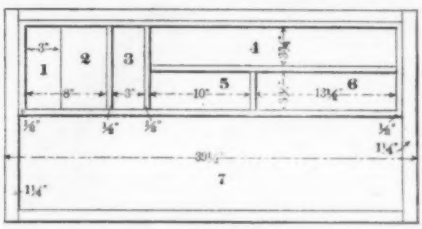


Fig. 3.—Plan View of Top Tray

a set of No. 1 and No. 2 stocks with cutters, from ⅛ to ¾ inch, right hand, and ¼ to 1 inch, left hand; also a set of dies, both right and left hand, for a No. 2 stock, from 1 to 2 inches. There is a space beside the level rack for one 36-inch pinch bar, two 36-inch chain tongs, one cross cut saw, and the level.

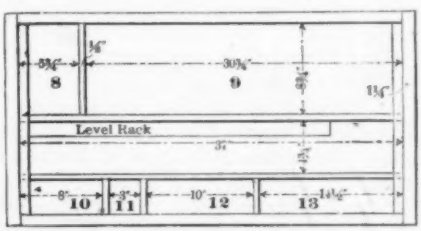



Fig. 4.—Plan View of Bottom

If these tools are packed snugly in the box they fit sufficiently close to prevent them shaking round much in traveling, when the jumper and overalls, etc., are also packed in. The steam fitter who is provided with this lot of tools is prepared to do all of the ordinary work that is required.

## SAVES 500 POUNDS COAL PER DAY.

A writer in the Street Railway Review tells how they bank the fires at night at the plant where he is employed. He says the method has been in use three years and saves 500 pounds of coal per day, while the boiler expansion and contraction is greatly reduced. He says:

About fifteen minutes before shutting down time if the feed pump is not running it is tested and boilers filled to three gages, the pump running very slowly. Next the fires are banked by pushing live coals against the bridge wall and covering with fresh coal, and the furnace, ash-pit doors and damper are closed. By this time we are ready to shut down and proceed to do so by closing water column valves, pump line valves—both steam and water—also the main stop valve in each boiler. We now have all the steam confined in the boilers at about 90 lbs. and we are ready to leave for the night. Of course we are always sure to have the safety valves in good order, but seldom does the pressure reach the blow point, which is 115 lbs.

We always cover our fires quite heavily and they hardly ever burn through which, of course, makes a little more work than pulling down a blank which is burned through nicely, but we always have a good fire to start with and from 80 to 100 lbs. of steam. About half an hour before starting up we open the stop valve just enough to allow steam to pass to warm pipes and expansion takes place gradually. In using this method it is important to open all valves in the morning that were closed the night before. Our boilers are insured by the Hartford Steam Boiler Inspection & Insurance Co. and this method has been approved by its inspectors.

## ACETYLENE GAS FOR BLOW PIPES.

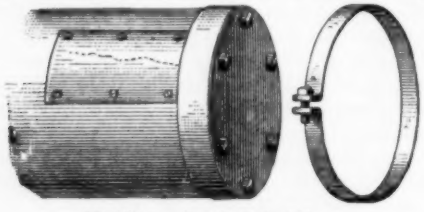
The adaptation of the blow pipe to the use of acetylene gas is an accomplished fact, and an interesting article by Andre Binet in Le Genie Civil sets forth its many advantages over other types of the instrument mentioned. Of these not the least is the very high temperatures which can be obtained; this last is not absolutely known, but is in the neighborhood of 4,000 degrees, and in any event much higher than the oxy-hydrogen blow pipe is capable of. Oxygen is used in connection with actylene, and being of higher caloric power than hydrogen accounts for the increase of temperature; the lower cost of acetylene as compared with that of hydrogen is also important where the blow-pipe is to be used for any length of time. The Metal Worker says the flame can be easily regulated as to its power, for the brilliant illumination given by actylene renders the effect of the different quantities of oxygen immediately visible, the reverse being the case where hydrogen is employed. Tests made with the new process show welded steel bars to have a tensile strength of 49,770 pounds per square inch.

## MELTING CAST IRON.

Of all the plans devised for melting cast iron turnings and borings in a cupola, probably the best one yet found is to place it in tight wooden boxes holding from 100 to 200 pounds. By this plan it is held together until it reaches the melting zone, where the boxes are consumed, leaving the iron in a compact mass to be melted. In this way an entire heat may be melted by placing the boxes in the cupola, a little distance apart, and putting coke between them to keep the cupola working open and free. By this means the oxidizing effect of the blast is reduced to a considerable extent, and a larger per cent of iron obtained than when thrown in loose. But oxidation is not reduced to sufficient extent to admit of a soft iron being obtained, says Dixie, and the iron melted is always white and hard. This fact should be remembered when smelting this iron with other irons, as the resultant mixture is similar to that produced when melting hard pig or scrap with soft pig. If the cupola is tapped close and iron drawn into small ladles, soft iron may be poured from one ladle while hard iron may be poured from another. The melting of this iron in boxes, in a heat with other iron, in the proportion of 5 to 10 per cent has been known to give satisfactory results in heavy work, for which the iron was drawn in ladles holding a number of tons, and the iron given an opportunity to enter into combination with the soft iron in the ladle, before pouring. But, even when treated in this way, and poured into a heavy casting, it has in some instances been found to not thoroughly unite with other iron, and to produce hard spots in the casting, and also excessive shrinkage in parts of the casting; sometimes causing it to crack at a point least expected, and at which the least strain on the casting should have taken place.

## MENDING A CRACKED JACKET.

A correspondent to the Blacksmith and Wheelwright gives two methods for mending cracked jackets, both of which are said to be satisfactory. As far as the working of the engine is concerned,



Mending a Cracked Jacket

it will be as good as ever after the repair is made.

In the first method a plate of sheet steel,, about No. 18, large enough to cover the crack, is used. Holes are drilled and tapped in the jacket for about ¼-inch screws. Under the plate is placed a sheet gasket, moistened with white lead and extending the full size of the plate. When the screws are tightened the job is complete.

The second method is even simpler, and consists of a clamp, made sufficiently flexible to be drawn over the cylinder. After the cracks are pulled together with this clamp, the oxide that will form in the crevices will make it waterproof. In making either of these repairs the assistance of the local blacksmith would probably be required.

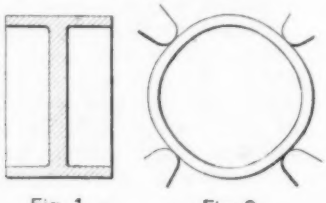


Fig. 1 Fig. 2

The Chicago & Northwestern railroad will retire from service and destroy all its 28,000-pound freight cars and a number of those weighing 30,000, because they are adjudged too light for modern traffic requirements. Four hundred of the cars have already been broken up.

"This tunnel is simply an outrage,"
The Hudson complainingly said;
"Just think of attempting to slumber
With men always under your bed."
—Harper's Bazaar.

Do you want help? Do you want a job? A Popular Mechanics want ad will get it for you.

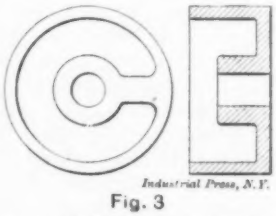
## DUPLICATE FLASKS.

Many foundries are often not well supplied with flasks for small castings, and it is a common occurrence to see a small casting made in the floor, with any old thing resembling a flask being used for a cope, four or more stakes driven into the ground serving as guides to locate it in its position on the drag part of the mold. Another not uncommon feature is to observe in a foundry yard a number of flasks jammed tightly together. These are usually misfits, which the molder has made an attempt to pair, the result being to jam the cope on the flask pins to such an extent that one of a pair is often broken in trying to separate them.

Foundries using such appliances cannot compete sucessfully with well-equipped shops, in which all flasks of the same size are duplicates one with the other. Not only is the molder enabled to put up a larger amount of work, but the quality is usually much improved. The ordinary sand match is generally used for small orders, while the plaster match is used where regular quantities of castings are required.

## SHOP USE FOR PLASTER OF PARIS.

A correspondent in Machinery writes: It is doubtful if you would find plaster of paris in many machine shops at which



Industrial Press, N.Y.

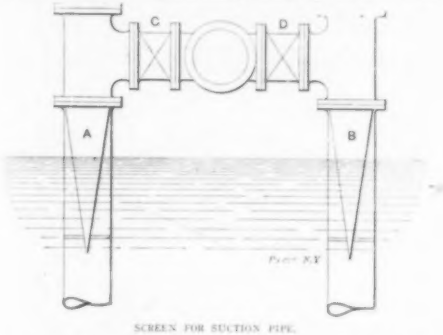
Fig. 3

you might inquire for it, yet it has frequent utility. Fig. 1 shows the section of a thin casting which is to be finished on the inside and outside, while Fig. 2 represents, exaggerated, the shape which it assumes when secured in a four-jaw chuck. Of course the work will not be round when it is removed from the chuck. If the side to be chucked is filled with plaster this difficulty is avoided. Fig. 3 is the expansion member of a clutch and is to be turned on an arbor. However slowly and carefully this turning is done the work will chatter and the finished piece will be neither round nor concentric. Here again plaster eliminates the difficulty and allows the turning to be accomplished with ease. After the work is finished the plaster can be readily broken up and removed.

## SCREEN FOR SUCTION PIPE

About five years ago I started using sea water for circulating in my two 800 horse-power surface condensers, and for nearly two years was troubled with kelp, seaweed, McGinty's whiskers, fish, barnacles and all sorts of matter from the sea. I tried all kinds of screens, such as screens on end of suction pipe, double ells and swivel joints, so that the end of the pipe with the screen could be brought up to the surface for cleaning. I finally discovered my present arrangement, which entirely overcomes all my trouble in that regard, says a correspondent in Power.

The accompanying sketch is self-explanatory. At first I used only one suction pipe, which worked excellently when I was operating only part of the




SCREEN FOR SUCTION PIPE.

twenty-four hours, but when I started operating twenty-four hours per day, without any stop whatever for years, I had to resort to the two-pipe arrangement shown in the engraving. A and B are conicle shaped screens made from No. 6 copper wire, ¼-inch mesh. Any kelp, seaweed, fish, etc., which the two circulating pumps in connection with an 8x12x8½x12 duplex salt water pump draw into this pipe are caught and stopped by these screens. When the screen gets nearly choked up, which happens more or less frequently, according to the condition of the weather and the sea, and which is easily detected by the action of these pumps, shut the gate valve C, take the blank flange from the top of the tee, withdraw the screen from the pipe and clean it. Any marine growth or barnacles growing in pipe are then cut out with a long bar, made of a piece of 1-inch tool steel, very sharp on the end and threaded on to a piece of ¾-inch gas pipe. This bar is light and long enough to reach clear down to the bottom of the pipe, and everything cut out of the pipe in this way falls to the bottom of the ocean and is washed away by the current and undertow. The pipe can then be painted on the inside with copper paint, which will stop marine growth to a great extent. When done, replace the copper screen in the pipe, which, by the way, is held in position by four ¾-inch brass studs in the tee on the top flange of the screen. There is also a guide, made from ½x1-inch brass straps, placed near the bottom end of the screen, to hold it in the center of the pipe. Close up the tee with the blank flange on top, open valve D and close valve C. You will then be ready to go through the same operation on the other side. It will be seen from the sketch that while you are cleaning one side the pumps are drawing water through the other. This arrangement has entirely overcome my trouble. I am using 12-inch pipe. This pipe runs out from the power-house on to a wharf, 700 feet, then drops 26 feet into the water. The bottom of the pipe is 16 feet from the bottom of the ocean. I use no foot valve, and never had any need for one in five years' operation.

## TESTING LUBRICATING OILS.

A simple test for lubricating oils is to place single drops of different oils across the end of a piece of plate glass about twenty-four inches long, one end of which is placed about six or eight inches higher than the other so as to form an incline plane. The drops of oil will run down this smooth plane in a race with each other and the quality of the oils for lubricating purposes is shown by the distance traveled and the traces left by the drops.

A light-bodied oil flows quickly, like water, but also dries, whereas what is needed is a good body, combined with a limpid flow, says the American Miller. Many oils have a good body, but have a tendency to gum, and this will be distinctly shown upon the glass. It is scarcely necessary to remark, that the test-slip should be covered from dust while the experiment is being made.

The above method will show the physical qualities of different oils, but if the presence of acid is to be detected, another simple device may be adopted. In a sheet of bright copper a number of shallow pits are made by the blows of a round-face hammer. Samples of oil left some days in these hollows on a shelf in the engine-room will show by the formation of verdigris, where acid is present. The existence of a blue tinge of fluorescence in a glass phial of oil is frequently assumed to indicate the presence of mineral oil, but this is an illusory test, as the same effect is frequently observed in the purest and freshest vegetable oils.

## NEW MOLDING PROCESS.

A new molding process for steel castings is reported as having been invented by Mr. Baldt, of the Penn Steel Casting Company, of Chester, Pa. The method consists in first making a master-mold from any pattern, and then casting from this as many fusible patterns as may be required. This fusible pattern is then put into an iron box of suitable size, after which, by means of compressed air, the box is filled with moulding sand. The box is then run into the drying oven, where the fusible pattern is melted out. The casting is then made from the dried mold. It is claimed as an important feature of this process that it does away with skilled labor.

## FORMULA FOR COLORING BRASS.

To produce a black color on brass Edwin S. Sperry gives a formula in Metal Industry as follows: Dissolve one pound of plastic carbonate of copper in two gallons of strong ammonia; first boil the brass that is to be blackened, in a strong potash solution to remove all grease and oil; rinse well and dip in the copper and ammonia solution, which should be heated to 150 to 175 degrees F., until the desired degree of blackness is acquired. The color produced is very uniform and has little tendency to peel off. The process works best on brass containing much copper, or on what is known as "red" brass. Directions are also given for making the plastic carbonate of copper as follows: Blue vitriol (sulphate of copper) is dissolved in hot water and a strong solution of common washing soda is added to it so long as any precipitate forms. The precipitate is allowed to settle and the clear liquid is poured off. Hot water is now added and the mass stirred and again allowed to settle. Again the clear water is poured off and the operation of adding hot water, settling and pouring off is repeated until everything has been washed out of the green carbonate of copper which remains at the bottom of the vessel. This is the plastic carbonate of copper referred to.

## LARGE OR SMALL PULLEYS.

Many well informed engineers contend that it is a mistake to use pulleys of very small diameter when larger ones can be used just as well. While it is true that small pulleys do not cost as much as large ones, this is about all that can be said in favor of the use of small pulleys. On the other hand, large pulleys, when used as substitutes for the small ones, save money during their entire lifetime, and therefore save many times the difference in first cost.

A six-inch belt running over a pair of twelve-inch pulleys may be able to do the work required without slipping and with only ordinary strain, and in so doing will, with care, perhaps live the ordinary lifetime of such a belt. If the same belt were run on twenty-four-inch pulleys, it is reasonable to suppose it would last twice as long with the same care, because the strain would be only half so great.

However, with twenty-four-inch pulleys it would not be necessary to use six-inch belts, as a belt four inches wide would do the work easier than a six-inch belt with a twelve-inch pulley, and would last longer if of equally good quality. The larger pulleys are in the end by far the most profitable, and should always be selected in preference to small ones if other conditions will permit.

## DEVELOPMENT OF THE GAS ENGINE.

Of late years the size of gas engines has much increased, says the Journal of the Franklin Institute. Many makers are now building machines of 2,500 horse-power, and are ready to double this efficiency. The development of large gas engines is closely connected with the evolution of the fuel-gas processes, and it is noteworthy that the first gas engines in England above 400 horse-power were operated with producer gas, while many of the large engines in Europe have been built for use with blast furnace gas. In August, 1902, two English firms had under construction over fifty gas engines varying in size from 200 to 1,000 horse-power. A classified list of engines made or making shows 327 such, with an aggregate horse-power of 182,000, or about 560 horse-power per machine. The last volume of the United States census reports 18,500 combustion engines in the country, with a total capacity of 165,000 horse-power, or only about 8 horse-power on the overage. This state of things is not likely to last long. One American firm has already sold over 40,000 horse-power of large engines, most of them of 200 and several of 1,000 horse-power. Another has recently built two 4,000 horse-power gas compressors and a number of 1,000 horse-power gas engines. The gas engines of the large size are extensively used for generating electric light and power, but there is a decided tendency to employ the smaller sizes direct as motors. Cheap fuel-gas processes will bring the gas engines to replace the electric motor for very many purposes, and we may look for development along these lines in the near future.

# Broncho Harry's Cinch

You kin bet thar wuz some talkin' on the
Di'mun' Circle range
When that "tenderfoot from Boston" come
among us fer a change;
Ev'ry feller in the outfit 'lowed they never
saw a chap
Lackin' more uv cowboy git-up—lightnin'
nerve an' fiery snap.
This here specimen from Boston wuz a most
amusin' cuss,
An' the fellers winked an' snickered when he
moseyed in on us,
An', in langwidge mighty proper, fer a chap
uv twenty years,
Struck the boss, Hair-Trigger Johnson, fer a
job at punchin' steers.

Frum his head clean to his bootheels, this
here Boston cuss wuz dressed
In a way that's often pict'ered uv us fellers
uv the west;
On his head wuz a sombrero, with a brim
eight inches wide,
An' in which this eastern geezer seemed to
take uncommon pride;
On his shirt an' down his breeches wuz some
gaudy buckskin fringe,
Fer to give his outfit color an' a sort o' west-
ern tinge;
An' he wore a brace uv barkers strapped
around his waist, to show
That he savvyed what wuz proper in the
woolly west, you know.

Hair-Trigger Johnson wuz a chap 'twuz allers
in fer fun,
Whether jest plain, common hoss-play er a
circus with his gun;
An' he looked in sort o' pity down upon that
Boston cuss,
Who stood gaupin' through his eyeglass, fust
at Johnson, then at us;
While us fellers uv the outfit who wuz play-
in' "stud-hoss," we
Dropped our keerds an' cocked our ears an'
listened quite attentively;
An' we reckoned if Hair-Trigger give the
tenderfoot a chance,
We would hev a holy picnic through his Bos-
ton ignorance.

Feller didn't savvy nuthin' 'bout the duties
of the range,
Yit, ez he wuz fresh frum Boston, we opined
'twuz nuthin' strange;
Never heered sich dum fool questions ez us
fellers listened to—
Thought this locoed eastern maverick must
hev sumhow slipped a screw.
Sed he'd "cotton mighty lively to a hoss if
once astride;"
Reckoned he "could pitch a rope, er tie a
steer an' shoot an' ride;"
An' the cuss appeared quite anxious fer to
l'arn the business, so
We prevailed upon Hair-Trigger fer to give
the kid a show.

When asked what he would tackle first, the
Boston dude replied
That he reckoned, ez a starter, he hed orter
l'arn to ride;
An' Hair-Trigger tol' the feller he hed made
the proper lead.
An' if Barkis then wuz willin' that the circus
would perceed.
Ev'ry feller wuz a-smilin', but the cuss he
didn't swerve,
An' we come to the conclusion that the dude
hed sand an' nerve;
Though we reckoned that when mounted on a
bronc', there'd be a change
In the feelin's uv this maverick uv the
Di'mun' circle range.

In the corral wuz a cayuse, which fer months
hed long defied
Ev'ry effort uv the busters uv that neighbor-
hood ter ride.
Wild ez any untamed critter, with a temper
hot ez hell,
El Diablo on the ranges stood without a par-
allel;
An' Hair-Trigger Johnson chuckled, but he
shook his head in doubt,
When the guy from Boston signaled fer to
trot the critter out;
An' though all us chaps sed nuthin', yit we
then an' thar opined
'Twould be safer far fer Boston if he'd up
an' change his mind.

Bar-X Billy roped the cayuse, an' we cinched
the sadde tight,
While the dude from Boston watched us, in-
terested in the sight;
Then Hair-Trigger slipped the bit on, sayin'
to him with a grin:
"If you've got yer prayers said, pardner,
reckon that you'd best begin."
Then the "tenderfoot from Boston" buckled
on his spurs, while we
Stood with anxious apprehension, wonderin'
what his fate would be;
Yit, we couldn't help a-smilin', when a-think-
in' uv the treat
That would tickle all us fellers when he hit
that saddle seat.

Say, you never seen a circus like us fellers
witnessed there,
When that tenderfoot got settled an' the
bronc' began ter r'ar!
El Diablo started buckin', but the feller
smiled at us,
Diggin' in his spurs an' laffin' when we'd
cheer the little cuss;
Then the bronc' got on his mettle, an' us
fellers never heard
Sich a squealin' an' a gruntin', but the dude
he never stirred—
Sot thar like a iron statue, rollin' uv a cig-
arette,
While our idees uv the feller somehow seemed
to all upset!

We'd expected that the tenderfoot would be
pitched in the air,
But the sandy little sinner simply sot a-grin-
nin' there—
Sot there through Diablo's tantrums jest ez
calm ez calm could be,
In between the fracas yellin', "Well, what do
ye think uv me?"
Then we heered Hair-Trigger holler: "Durn
ye, stranger, what's yer name?
You're no ornery blank-blanked sucker at
this 'ere rough-ridin' game!"
An' the tenderfoot he answered, when the
bronco stopped ter rest:
"Some folks call me Bronco Harry; champeen
rider uv the west!"

—E. A. Brininstool, in Sunset Magazine for March.

# Asphyxiate Insects With Gas

## New Method Employed in California Presages a Glorious Future for the Fruit Grower

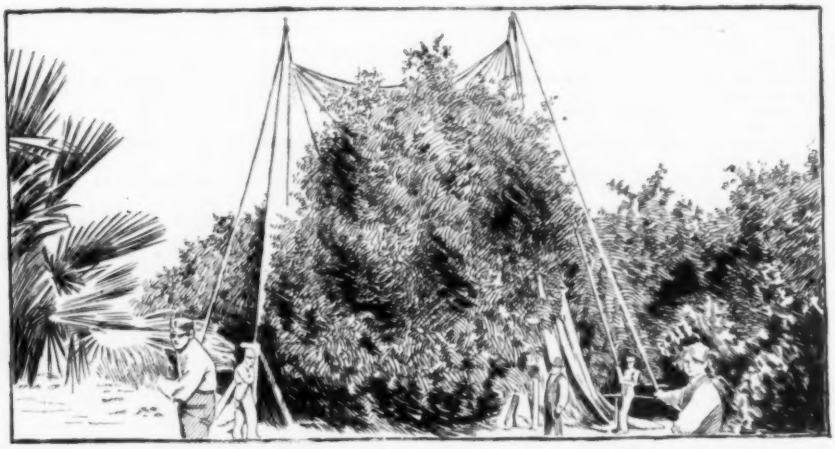


Fig. 1.—Method of Hoisting Tent Over Orange Tree

Destroying insects by asphyxiating them with gas has worked with such splendid success in California that the method promises to become universal, and it heralds the day when worm-blighted fruit crops will be unknown. Hydrocyanic-acid gas is used, and the method is called "gassing." The wonderful results it has shown on the Pacific coast are believed to mark a new era in fruit growing. Millions of dollars may be saved orchardists in America and elsewhere through the new discovery, and an abundance of pure, wholesome fruit may cease to be a luxury. The United States government has already investigated the system and placed its official seal on the declarations of its success. The investigation on the part of the United States Department of Agriculture was in charge of C. L. Marlatt, entomologist in charge of experimental field work. In his forthcoming report he will state:

"The gassing method is undoubtedly the most effective means known of destroying scale insects. When done at the right season and properly, one good gassing very frequently will almost, if not quite, exterminate the scale insects from

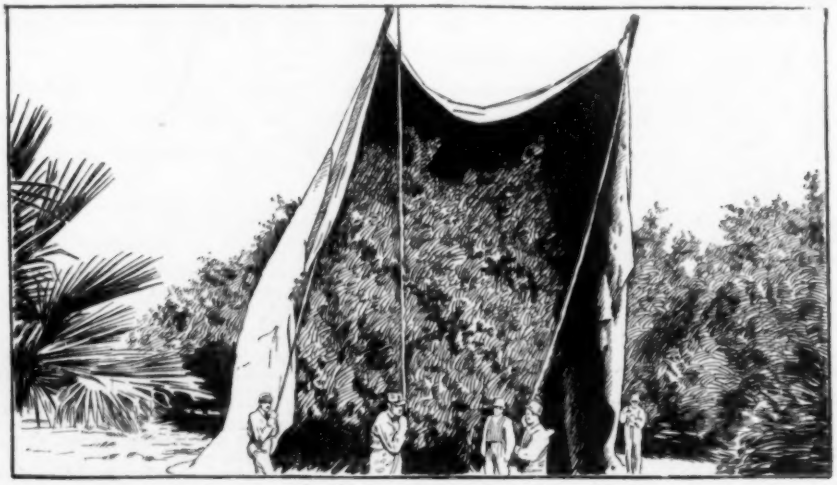


Fig. 2.—Tent Carried Over Tree by the Falling of Pulleys

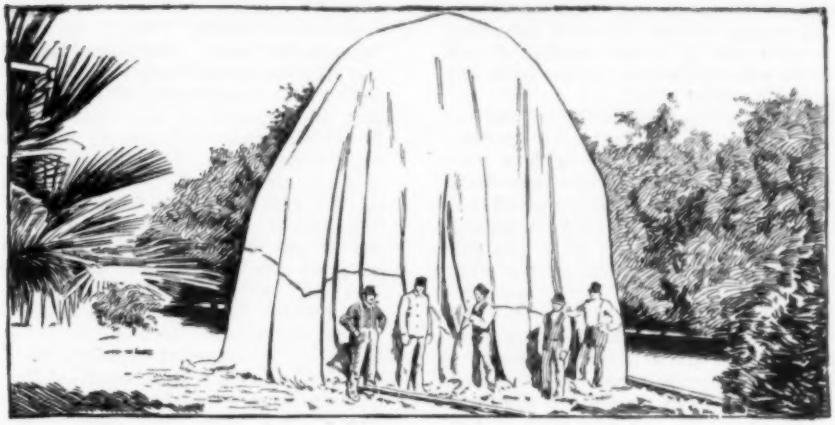


Fig. 3.—Tent in Position for Fumigation

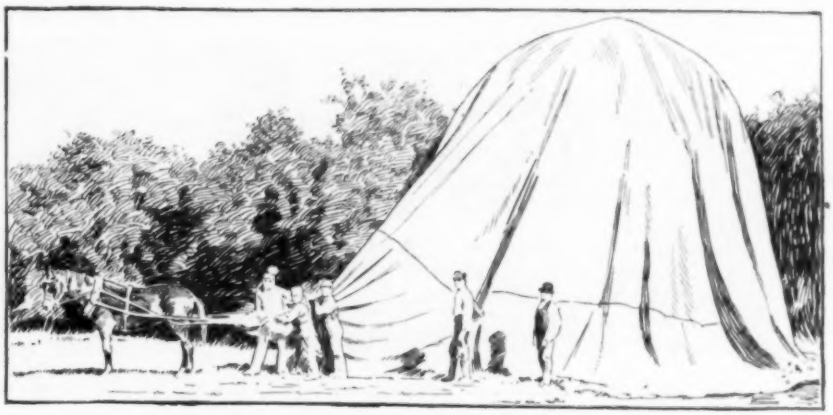


Fig. 4.—Removing Tent by Horse Power

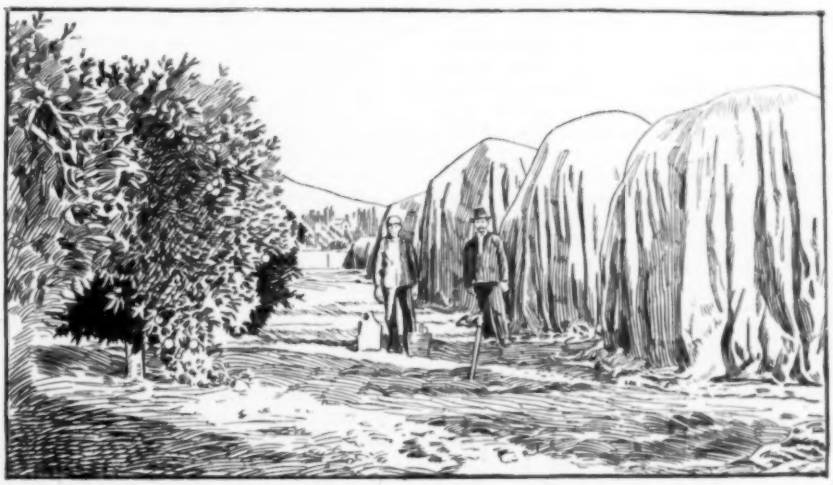


Fig. 5.—Series of Tents for Continuous Operation

the treated trees, giving them comparative immunity often for two or more years. The use of hydrocyanic-acid gas is therefore strongly urged wherever the conditions warrant it."

The "gassing" method of destroying insects is purely mechanical. It consists in inclosing a tree at night with a tent and filling the tent with the poisonous fumes generated by treating refined potassium cyanide (98 per cent strength) with commercial sulphuric acid (66 per cent) and water. The treatment should continue from thirty to forty minutes. The work is done at night to avoid the scalding which follows day applications. A fumigation of the orangery of the Department of Agriculture demonstrated that half an ounce of cyanide to the hundred cubic feet kills the eggs even of the black, purple and other scales. For small trees ordinary earthenware vessels may be used to generate the gas. For large trees requiring heavy doses, tall wooden pails have proved more practicable.

Prof. Marlatt says: "It is important that the water be put in the vessel first, and then the acid and lastly the cyanide. If the water and cyanide are put in the vessel first and then the acid poured in afterward, there is danger of an explosion, which will scatter the acid and burn the tents and the operator. The extraordinarily dangerous nature of the gas must be constantly borne in mind, and the greatest caution should be taken to avoid inhaling it. The person handling the chemicals should always have an attendant with a lantern, to hold the tent and enable the cyanide to be quickly dropped into the generator and to facilitate the prompt exit of the operator. Practically the only tent now used is the so-called 'sheet tent,' which is drawn over the tree by means of pulleys. (Figs. 1-3.) For very large trees averaging thirty feet in height it is often necessary to employ two sheets to effect a complete covering. Some of the tents are of great size. The one illustrated in the figures has a diameter of seventy-six feet. It is constructed of a central piece fifty feet square, of ten-ounce army duck. Four triangular sidepieces, or flaps, of eight-ounce duck, ten feet wide in the middle, are strongly sewed to each side of the central sheet, forming an octagonal sheet seventy feet in diameter. About the whole sheet is then sewed a strip of six-ounce duck, one yard wide. The tent is handled by means of ropes and pulleys. A 1½-inch manila rope is sewed about near the edge of the central piece in an octagonal pattern. Rings are attached to this rope at each of the eight corners thus formed, and also on opposite sides of the outer edge. To these rings the pulley ropes are fastened, and the tent is elevated over the tree and handled as indicated in the plates."

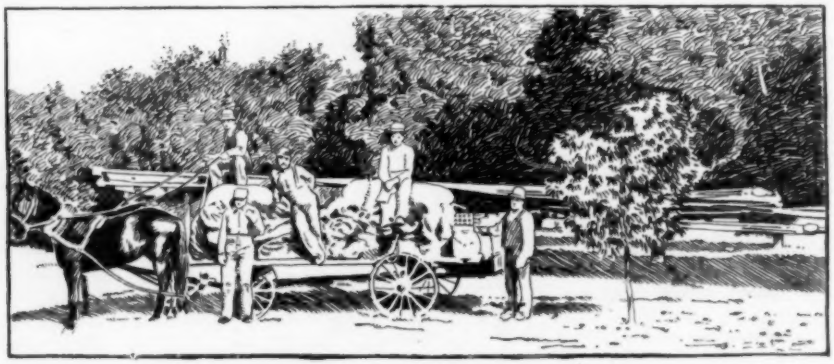


Fig. 6.—Tents, Tackle and Chemicals Loaded for Transportation

About fifty trees of the largest size can be treated in a night with an equipment of twelve or fifteen tents. By the time the last tent is in place the fumigation in the first is completed, and it can be taken down and moved forward, and so on with the others. Thus the men at work handling the tents are kept continuously employed. Working in the same way with smaller trees the number which can be treated in a single night is very considerable, it being possible to gas from 300 to 500 trees averaging ten feet in height in eleven or twelve hours, empolying thirty-five to forty ring tents.

## CEMENT FOR RUBBER TIRES.

A good cement for rubber tires may be made as follows: India rubber 4 parts, coal tar naptha 34 parts. Dissolve the rubber in the naphtha, aided by gentle heat and stirring, and the mixture will be as thick as cream. Put up in air-tight collapsible tubes.

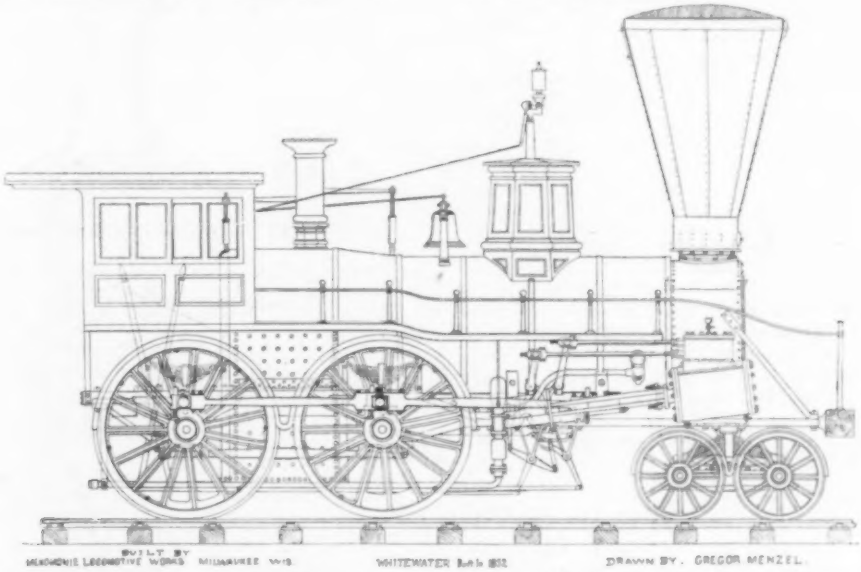
## EARLY WESTERN LOCOMOTIVE.

### Type Manufactured in Milwaukee in 1852 and Run on the Old Milwaukee & Mississippi Railway

By Henry W. Bleyer, of Milwaukee

Editor Popular Mechanics:

It affords me a rare degree of pleasure to contribute to the pictures of locomotives of the fifties now being gathered by Vinton Stillings, J. M. Kimball and other of your correspondents. The engine here pictured was the second of twelve or more that were manufactured in Milwaukee by the Menomonee Locomotive Company as early as 1852-56, the first one—the "Menomonee"—having been placed on the tracks of the old Milwaukee & Mississippi Railway, now part of the Chicago, Milwaukee & St. Paul system, on the 21st of October, 1852, and the "Whitewater" on the 11th of January, 1853.




The only marked difference between the first engine and the one here illustrated was that the former had inside connections and the latter outside connections. All engines afterward manufactured by the Menomonee company were of the "Whitewater" type, varying only in such details as experience had from time to time suggested to the builders. Each of the engines proved as staunch and durable as the "Wisconsin," in Egypt and India, and to a German so landed here by the schooner "Abiah" on the 12th of September, 1850. The boilers, which were 47 inches in diameter, had 168 copper flues, each 10 feet 6 inches long, and each of the fireboxes had 11 feet of grate surface, for wood fuel. The cylinders were 15 inches in diameter, with 20-inch stroke, and the four driving wheels were each 5 feet and 6 inches in diameter. In point of weight the engines averaged about 26 tons.

As shown in the engraving, these engines were provided with handrails and footboards along their sides, a feature referred to by J. M. Kimball in a recent number of Popular Mechanics. There weer no pilots or "cowcatchers" on the Milwaukee engines, and each bore a name, not a number, as is the vogue in our more practical days.

The builders of these locomotives, successors to Lee & Walton, machinists, continued in business until the 18th of December, 1856, when their establishment was destroyed by fire. There was every prospect that they would rebuild the works on a more extended scale, when the financial panic of 1857 utterly balked their plans.

Gregor Menzel, the designer of the engines, was a native of Prussia, who came to Milwaukee in 1850, and at once became prominent as a versatile engineer. He built the first 200-horse-power stationary engine, the first passenger elevator, and a thrashing machine novel in construction. Shortly after the Menomenee works were destroyed, he settled permanently in Minneapolis, where he founded the "North Side" iron works, in which his genius as a constructive engineer had full play until he passed away.

## TELESCOPE EXPLORES THE DEEP.

**Looks Around Corners and Under Vessels—The Pino Hydro cope**

The hydroscope is an instrument for enabling one to examine visually submerged bodies. This particular one is for use in examining the bottoms of vessels. It consists of a telescoping tube, with one or more right-angle bends, in which are placed mirrors, says the Electrical Review. The lower part carries a number of incandescent lamps, which serve to illuminate the object to be examined. A system of wipers, operated by hand, serve to remove all moisture condensing on the glass cover or mirrors. The instrument can be arranged to examine surfaces in a vertical position, or, by the addition of a second bend, the bottom of vessels. The outer surface of the glass end-plate is kept clean by streams of water. Lenses are arranged within the interior to condense the beam of light and transmit it to the eye-piece at the upper end.

## HOW TO PAPER A CEILING.

When, in order to strengthen a surface or hold up a badly cracked ceiling, the surface is covered with paper canvas, the object to be aimed at it to hang the paper smooth and straight. Very much depends upon the laying of the first length, says Artistic Home Ideas. It must be laid perfectly true in straight line; the other lengths will then follow straight. A straight line, struck by means of a chalk line down the center of the space to be "lined," will serve as a correct start and hold all the other lengths to accuracy.

For work that butts, a straight-edge with a steel edge to it, and a trimming knife are necessary, especially for stout paper. Many manage to do the work with a pair of scissors, but in that case the edges seldom meet accurately. A roller is also of service to rub the edges well down. A roll of paper held in the left hand is useful; it helps to hold up the limp pasted lining paper when applying it to the ceiling, leaving the right hand to fix the paper to the joint. It is then easy to sweep the paper up with the roll in the left hand, continuing to butt or lap the paper with the other hand by means of a cloth or brush. When the paper is pasted and folded, take in the left hand the roll you are using to help to lay the pasted paper, and place it under the center of the paper; then unfold the right end of the paper, which should be the shortest fold. In this way carry it up the steps.

The short way of the ceiling allows shorter and more manageable lengths to be hung, but the lap should be hung away from the light, so as to be less perceptible. Begin at the light, work away from it so that the laps do not show. Lapped paper is certainly less liable to curl up from the ceiling than when it is butted.

## WIRE SLING FOR BROKEN ARMS.

A wire sling or basket, for supporting a broken or injured arm, is a recent English invention. The British inventor

Wire Sling for Broken Arms

says it can be cleaned in two minutes and is light, cool and firm.

## NAVIGATION AT A DISTANCE.

A resident of Dorchester, Mass., has just completed a series of experiments by which he is enabled to control all the movements of a boat in midstream while sitting on the banks.

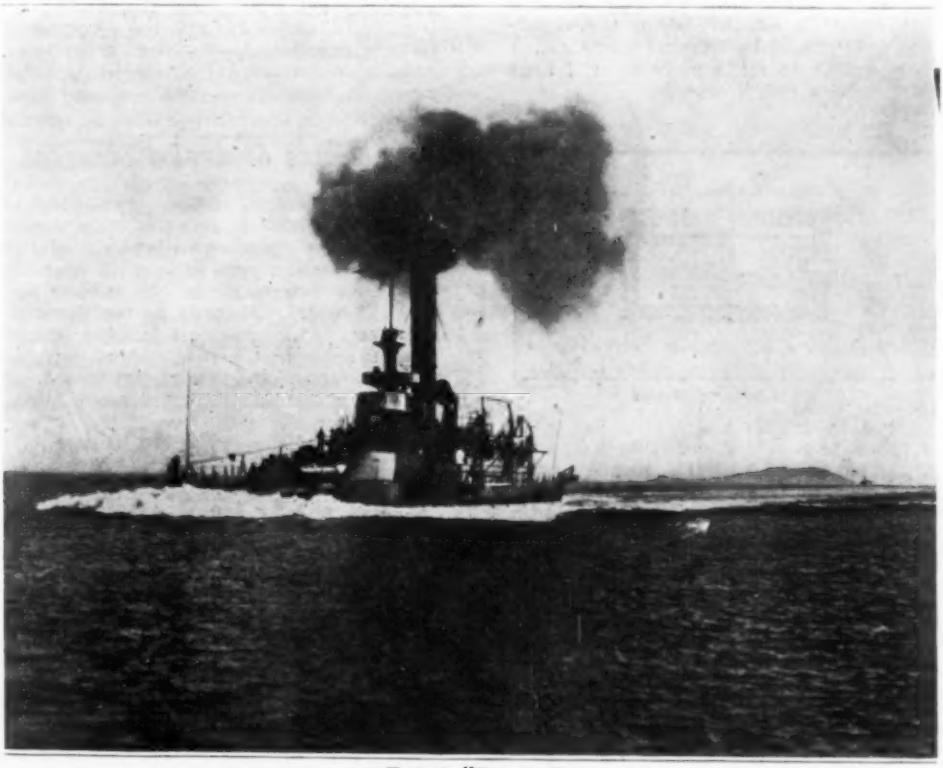
The device used is similar to the wireless telegraph. The scene of his operations is at Milton, on the Neponset River. Here a long pole wound with two large coils of wire is set in the ground near to an eight-volt battery, generator, and a transmitter. The boat, which is seven feet long, is fitted with an elaborate receiving apparatus.

By means of the transmitter on the shore the inventor sends wireless impulses to the boat and is able to make it weigh anchor, cast off, go ahead, back water, and perform all other movements of a real vessel. The inventor states that it will be easy to put such an apparatus into operation in a large boat, the only thing necessary being to direct and send the impulse from the transmitter on shore to the receiver on the boat. He is now at work on a model of a lifeboat to be similarly managed, which he believes he can put to practice on big boats.

## SUCCESSFUL TRIALS OF THE WYOMING.

### New Harbor Defense Vessel Built at San Francisco an Important Addition to Our Navy

The United States Steamship Wyoming has just had its successful contract trial at San Francisco. The trial was made by the standardized screw method. Four points of the speed and revolution curve were determined by making a double run for each point over a measured mile course in San Francisco bay. The revolutions per minute necessary to give a speed of 11½ knots were found from this curve and the vessel was taken outside the bay for a two hours' run in the open sea.



U. S. S. "Wyoming"

The Wyoming is a twin-screw, single-turreted monitor, built by the Union Iron Works of San Francisco, being one of the four harbor defense vessels whose construction was provided for by act of congress in 1898. The vessel has a displacement of 3,214 tons; she has 3,218 horsepower and a speed of 11½ knots per hour. Her cost was $975 00. Her main battery consists of two 12-inch breech-loading rifles and four 4-inch rapid-fire guns. The second batery has three 6-pounders rapid-fire guns, five 1-pounder rapid-fire guns and two colts.

## ENGRAVING GLASS WITH GELATINE.

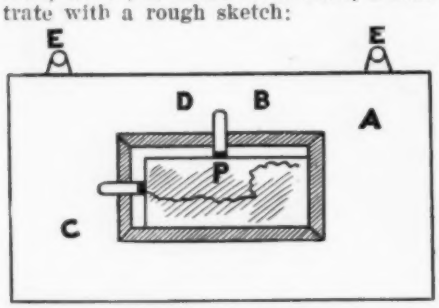
A singular property of gelatine, when spread upon glass, has lately been experimented with by the French chemist, Cailletet. When a thick layer of strong glue, that has been allowed to dry upon a glass surface, is detached, it carries off scales of glass and leaves designs resembling those of frost on the window-pane, says the Keystone. Polished marble and quartz are similarly attacked. With glue containing six per cent of alum Monsieur Cailletet produced five designs, resembling moss in texture. Hyposulphite of soda and nitrate and chlorate of potash, added to the glue, produce analogous effects. The glue while drying exerts a powerful mechanical strain.

The multiple train control is the latest device patented by George Westinghouse.

## A SIMPLE CLOUD-PRINTING DEVICE.

The following method for printing clouds on lantern slides or transparencies I believe to be new, says a contributor to the Photo-Beacon.

The negative from which the foreground part of the picture is to be made is taken and a transparency made from it in the usual way in an ordinary printing-frame, the sky portion being kept shaded during printing as much as possible with a card or duster, to insure a blank white sky in the positive. This is developed, washed, fixed and washed and dried as usual. When thoroughly dry, it is placed in a frame made as follows, which, to make more clear, I illustrate with a rough sketch:




Cloud-Printing Device

For 4 by 5 size, a perfectly flat piece of board is taken of about half an inch in thickness and 10 by 12 inches square, and about the center of this four strips of wood are glued or screwed, making a frame which will hold loosely two plates dropped in when the board is in a horizontal position. Now one more detail and the board is complete. This board, with the plates, is to be placed in a vertical position, so to prevent the glass from falling out it is necessary to cut on two sides of the frame slots for two pegs to be inserted, which should work stiffly, so that when both are pushed against the edges of the plates in the frame they keep the latter hard against the two opposite sides; thus there is no fear of breakage. I especially advise the use of rather large pegs, which should be tipped with rubber, as plates vary as much as a one-sixteenth inch in size very often.

In the sketch is shown the complete apparatus. A, the large board, on which the frame B is fixed, with C and D, the pegs which are pushed in on the edges of the plates P.

It is now necessary to hang this upon the easel of your enlarging apparatus, having previously dropped in the frame an exposed but undeveloped plate for focusing upon. In the carrier of your enlarging lantern put your cloud negatives. When you have got a clear and sharp image on your white undeveloped plate, cover your lens, and substitute for it a plate from the box, face upwards as before; then take your transparency with the blank sky, and put that on top of the live plate, film down. Tighten up your wedges, hang up your board--in the same position, of course, as before--and expose, shading the landscape portion roughly with a card. This gives you a positive cloud picture, which will have the clouds only in such places as were not protected by the positive. It now only remains to dry the cloud positive, and then bind it and the foreground picture together in register, when you have a combination from which can be made an enlarged negative of any size whatever.

## SIZE LIMITS OF STEAM TURBINES.

Edwin Yawger, before the Electric Club of Cleveland, recently was asked how small a turbine can be built of the Parsons-Westinghouse type with economical steam consumption. In answer Mr. Yawger said: "There is no real limit to the size. A very small turbine would have to travel at a tremendous rotative speed, because the peripheral speed of the vanes on a small turbine would probably be as great as on one of the largest sizes. One of the first turbines that Parsons built was, I think, 10 kilowatts, and ran about 18,000 revolutions. However, 400 kilowatts is the smallest size we build."

Another member asked how large turbines are being built at the present time, and Mr. Yawger said: "We took an order last week for three 5,000-kilowatt turbines. That is practically the largest we have ever designed. They are not yet built. I don't know whether we will design them for 10,000 kilowatts or not, but I do not see why it could not be done. There seems to be no drawback to making them large."

## ARTIFICIAL SILK.

According to a new French process, collodion for the manufacture of artificial silk is prepared with pyroxylin, which has been dried centrifugally and by exposure on screens to the open air, or to air current warmed by water or steam pipes, to a temperature not exceeding 30 degrees C. Such pyroxylin contains from 6 to 10 per cent of water, and can be kept without deterioration. It is dissolved in ether and alcohol made alkaline by the addition of an aqueous alkaline solution. The presence of acid in the thread is thus avoided.

## MOSQUITOES CAUSE FIRE ALARM.

### Cloud of Them About a Building--Mistaken for Smck ard Firemn Rush to the Recu

The first account on record of mosquitoes causing a fire alarm comes from Gloucester, Mass., where there exists a small but formidable breed of the insects that have a habit of gathering in dense swarms at sundown. It was while working on a fire in Gloucester that the firemen saw what they believed a great column of smoke coming from the roof of a neighboring hotel. The alarm was sent in and companies from all over the city came rushing to the rescue. It was only after firemen had scaled the walls that they discovered the smoke to be nothing more than a great swarm of mosquitoes. The insects were issuing from the lee of a big ball that crowns the hotel cupola.

## NEW METHOD OF INFLATING A BALLOON.

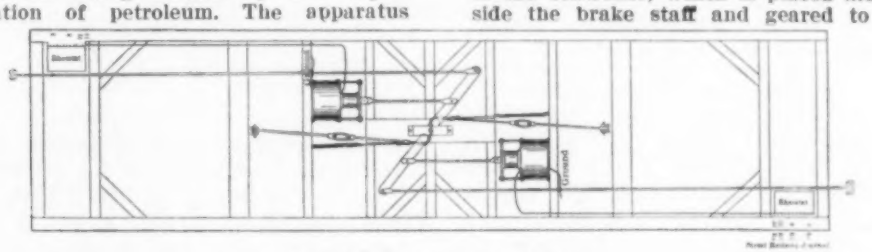
Mr. J. N. Maskelyne and the Rev. J. M. Bacon, the well-known balloonist, have been for some time past carrying out a series of important experiments so as to improve the method' of inflating balloons, says the Aeronautical World. The new principle used is ingenious and highly effective. It consists of the inflation of balloons by means of hot air, the air being heated by the vaporization of petroleum. The apparatus for generating the hot air is carried in the car of the balloon, being very compact and easily controlled. A trial was made recently at Cold Ash, near Newbury, and it completely demonstrated the success of the invention of Mr. Maskelyne. A large balloon of nearly 70,000 cubic feet capacity was inflated by patent burners in less than an hour, the burners vavporizing only a few gallons of oil. The balloon was then tested for its lifting power, and the test proved most satisfactory. The trials mark a definite and important departure in the progress of ballooning.

## SHIP FRUIT WITHOUT ICE.

The first car load of fruit to come across the country without ice arrived in St. Paul from San Francisco a few days ago. It was a car of oranges shipped by the new process of confining the fruit in a dry atmosphere of medium temperature, charged with antiseptic germicidal gas. The fruit is said to have arrived in first-class condition. It is maintained that the percentage of loss was much smaller than on fruit sent in refrigerator cars. The two days' time necessary for the restocking of refrigerator cars was saved by the new process. The effect of the treatment of the fruit in the car is to destroy the germs in the atmosphere and on the fruit and, by the gas uniting with exuded juice, form a germ-proof coating which protects the fruit and keeps the juices from further evaporation.

## ELECTRIC BRAKE FOR TROLLEY CARS.

The electricians of the street railway at Rochester, N. Y., have built an electric brake which acts instantly and possesses great power. The Street Railway Journal says: "By reference to the cut it will be seen that the brake proper comprises two cylinders. These contain three magnetic coils each and a plunger, which is directly connected to the equalizing lever under the car. Connecting wires lead from these coils to the controller, which is placed alongside the brake staff and geared to it, so that the turning of the brake staff applies the power to the magnetic brake."



Instantaneous Action Electric Brake

About five amperes are sufficient for a stop and the cylinders exert a pull of seven inches. The controller for operating the brake has five notches.

The center of grain production in the United States is located by the census bureau at about 31 miles southeast of Burlington, Ia. It has taken 50 years to move this point from 20 miles east of Cincinnati.

## HOW TO MAKE A LARGE INDUCTION COIL—IV.

Having made the primary and secondary coils, they must next be mounted in a suitable framework and provided with some form of interrupter for making and breaking the primary current.

The supporting framework should preferably be made of well seasoned mahogany, although any wood capable of taking a good finish will do. A base should first be made whose length is 18 inches, and which is 8 inches wide. To prevent warping, it is best to dovetail a strip of wood across each end, or else make the base of two boards glued and screwed together, with the grains of the pieces at right angles.

Two upright pieces of wood will be needed, each five inches square and three-fourths of an inch thick. Through the center of each bore a hole which will just fit the primary tube. Then the latter may be slipped into the upright pieces, one at each end, and the uprights screwed to the baseboard, thus securing the coil firmly to the base. The position of the coil is shown in fig. 7.

The binding posts should be provided, to receive the terminals of the secondary. They should be mounted on two hard-rubber blocks, shown at R, and then the latter are fastened to the upright strips.

Two straight pieces of brass wire about 6 inches long, shown at P, should be made. They should slip easily through the holes in the binding posts, but should not be loose enough to "wobble." Each must be pointed at one end and provided with a handle of hard rubber at the other.

An interrupter of the well-known hammer type is shown at the right. A rather limber brass spring is provided with an iron armature, H, the spring being of such a length that H is directly opposite the end of the iron core of the coil. The end of the latter should just come flush with the end of the tube. There should be about one-eighth of an inch space between H and the core.

At D, about one inch below the center of H, a small hole is drilled in the brass spring, and a piece of small platinum wire riveted into the hole. The screw, B, which rests against D, is also tipped with platinum, and it is supported by a very stiff piece of brass.

One end of the primary coil is connected to a binding post (not shown), and the other end to the spring which supports H. Then B is connected to a second binding post on the base.

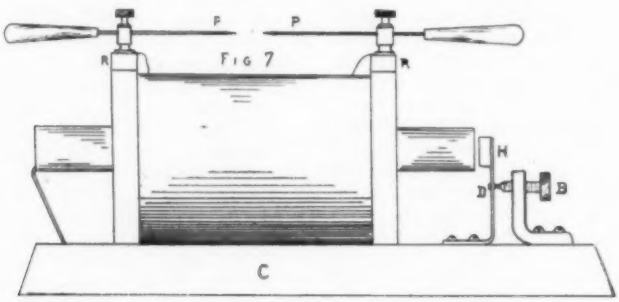


Fig 7

When a battery of five bichromate cells (large size) is connected to the instrument the hammer, H, should fly rapidly back and forth, breaking the primary circuit at D.

In order to work well, however, a condenser must be bridged across the spark gap at D. This condenser may be made by taking about 100 sheets of tin foil 5 inches by 7 inches and stacking them up with a sheet of paraffined typewriter paper( thin) betweeen them. Every odd numbered sheet is connected together, forming one terminal of the condenser. The even numbered sheets, connected together, form the other terminal. The condenser should be clamped tightly together.

When provided with a condenser as described, the coil should give a four-inch spark without difficulty.

## HOW TO SHOOT AN OIL WELL WITH DYNAMITE.

A writer in Power says: I had occasion to cut off a 10-inch pipe within the last year, and used the following plan. Get a can made 12 inches long and 4 inches diameter; the bottom should be cone shaped and the top shouldered, as per illustration, and a bale fitted to it. Put in four sticks of 80-per-cent, or six sticks of 60-per-cent dynamite, with fuses in at least two of them, and fill the can with sand to sink it. Connect

SHOOTING A WELL

one wire from each fuse to one wire of the battery and the rest of the wires to the other battery. Tape all joints thoroughly and push them inside of the can, and fill the neck with soap or tallow (cold). Loop your battery wires securely around the bale, to lower can or raise it if need be. Mark off the distance on the wires that you wish to cut the pipe off below the top of the well, then lower till the mark comes to the top of the well and make fast. Now take the two ends of the battery wires, pay out and connect one side to your battery and make connection with the other. The result will be an explosion and shower if the well is shallow. The wire used for battery wires should be waterproof or rubber covered. The battery may be a firing machine or six Leclanche cells. If the latter, don't try to connect, but insulate the ends to hold by, and taking an end in each hand, touch the two opposite wires for an instant. The object of the can having the conical bottom is so that it will glide by obstructions without jar. The sand is to sink it. The bale is to take the strain off the fuse wires. The soap seal is to keep water out, as it would quickly short-circuit the fuse wires and cause failure. Two or more fuses insure of an explosion. The method of connecting batteries is three in series, two in parallel, thus giving more current. If the charge fails to explode, put two in series and three in parallel. You will then have 50 percent more current with about 3 volts E. M. F., which, if connections are well made, will be enough. No matter what kind of battery you have, don't attach the wire to it until charge is home and all hands clear away from the well, as there is often an idiot around that wants to know whether the battery is in working order, and may push down the handle or touch the other wire up and cause the loss of the explosive, can and other property. In charging, take a stick of dynamite and open the paper at one end (taking care not to tear it) and with a pointed stick or lead pencil make a hole in the dynamite and insert the fuse. Bring the paper around the wire and tie it with good stout twine. It is a good plan to handle dynamite with an old pair of gloves that can be thrown away, as getting it on the skin causes severe headaches to those unaccustomed to handling it. Remember that if in friction between metals it is very dangerous. The old stuff is not reliable for results, as it will exude its strength more or less, according to circumstances, and is dangerous to handle.

Unless there is water enough to cover the can several feet the chances are that you will only blow up and down the hole, though a bushel or two of sand will hold it.

## RECIPE FOR MILL PICKS.

A reader of the American Blacksmith has found the following an excellent recipe for mill picks:

Two ounces of alum, two ounces of saltpetre, one-half ounce of salammoniac one and one-half pounds of salt, and three gallons of soft water. Heat the picks to a cherry red and plunge them in the above preparation, and draw no temper.

Pauta, Peru, is said to be the dryest spot on earth.

# Popular Mechanics

"Written So You Can Understand It"

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**LONG DISTANCE TELEPHONE MAIN 2682**

Application made at Chicago Postoffice for entry as mail matter of the Second Class.


A locomotive testing laboratory will be a feature of the transportation building at the World's Fair.

The first "blacklist of habitual dunkards," published in London under the new licensing act, shows three times as many women as men.

The New York Central railroad will spend $20,000,000 in new improvements, including double tracks, sidings, extensions, building bridges and general betterment of the system.

Small steam engines of from ¼ to 1 horse power, with boiler to correspond, are illustrated and described in a very interesting catalog just issued by the Martin Mfg. Co., 180 West Madison street, Chicago. It will be mailed free, on request, to readers who mention Popular Mechanics.

## NEW BLOW PIPE A WONDER.

Generating an extremely high temperature with a needle point non-oxidizing flame, a double jet alcohol blow pipe which has just made its appearance on the market promises to work some wonderful changes in methods now employed by jewelers, opticians and dentists, as well as electricians and others who require a hot, clean needle flame for fine soldering. The device is manufactured by the Turner Brass Works, 55 North Franklin street, Chicago. Its special value may be illustrated by the fact that it replaces the oxy-hydrogen blow pipe for lead-burning in the connecting of lead storage batteries, which proves the cleanness and the non-oxidizing qualities of the flame. The blow pipe is handsomely nickel plated and weighs but three pounds when packed for shipment. The capacity of the reservoir is one pint. The burner is made of the celebrated double jet principle, specially constructed for the consumption of wood alcohol. This burner is said to produce twice the heat of the ordinary burner, because the air and gas are mixed in an entirely new way, so as to produce what has been declared absolutely perfect combustion and the maximum degree of heat.

The blow pipe is started by pumping a strong pressure into the reservoir by means of the pump contained in the handle, then opening the lower valve and allowing the alcohol to flow into the cup below the

burner. The valve is then closed and the alcohol in the cup lighted with a match. Its burning heats the burner sufficiently to generate gas, which is ignited by opening the lower valve again and holding a lighted match in front of the burner. The flame is then regulated by opening the upper valve to the desired extent.

This blow pipe generates a temperature of over 3,000 degs. F., and has the capacity to melt pure gold. It will also flow 25 per cent platinum solder, and even 50 per cent solder under favorable conditions.

Electricians will find it especially useful for telephone switchboard work, for soldering fine wires, and also for making connections in lead storage batteries. For jewelers and opticians it is specially valuable. Full descriptive circulars, prices, etc., will be furnished by the manufacturers of these blow pipes on application.

## REGARDING "SUBSTITUTE FOR STEREOPTICON."

To the Editor: I have before me a May issue of your paper and wish to give you some information regarding the "substitute for stereopticon," which you describe on page 349.

You ascribe the invention to Mr. Edward C. Pickering of Harvard, who, in my opinion, should not have that credit. Over two years ago in Baltimore, while employed by the Acme Engineering Company, I constructed one of these devices; also previous to that I used one while employed by the "Baltimore Herald." I have seen them in use three years ago on the Philadelphia Inquirer and also the Philadelphia North American This is a device which naturally suggests itself to everyone having to cut negatives, and I have met at least a dozen persons who claim to be the original inventors of this device. The "substitute for stereopticon" is a very common contrivance among photo-engravers and is known among them as a "negative cutting rack." I inclose a sketch of such a rack, which I devised two years ago.

ROBERT C. KROLL,
St. Louis.

## TO SAVE THE ALAMO.

### Texans Asked to Contribute $1 Each to Prevent the Mission's Defamation.

Every resident of Texas and of other states who will has been called on by the Daughters of the Republic of Texas to contribute $1 each to save the Alamo from being bought by an eastern firm and used for advertising purposes. The De Zavala Chapter, Daughters of the Republic of Texas, P. O. Box 1021, San Antonio, Texas, has sent out the following appeal:

"We need the co-operation of every true Texan and lover of liberty in the effort to save this sacred antiquity—the Alamo. It is the desire of the Daughters to buy the remainder of the building and its surroundings—sacred to the hearts of all Texans—restore it and make it a worthy and artistic monument to the memory of those dauntless hero martyrs who fell inside its walls. They propose to convert this Thermopylæ of the new world into a Texas hall of fame, where every hero and all great Texans shall be remembered, to make it a museum of Texas history, art, literature and relics; where shall be gathered all matter interesting and instructive, pertaining to Texas or her people—a noble monument of which all Texans shall be proud and to which they may point in refutation of the old adage, 'Republics are ungrateful.' Let each Texan or citizen 'Remember the Alamo' and enter his name on the lists to be kept as a perpetual record of 'Those who saved the Alamo!'

"One dollar only is asked from every loyal Texan or citizen of the state to accomplish this end, so that each may have his name inscribed on the roll of those seeking to perpetuate the Spartan deeds of the early Texans."

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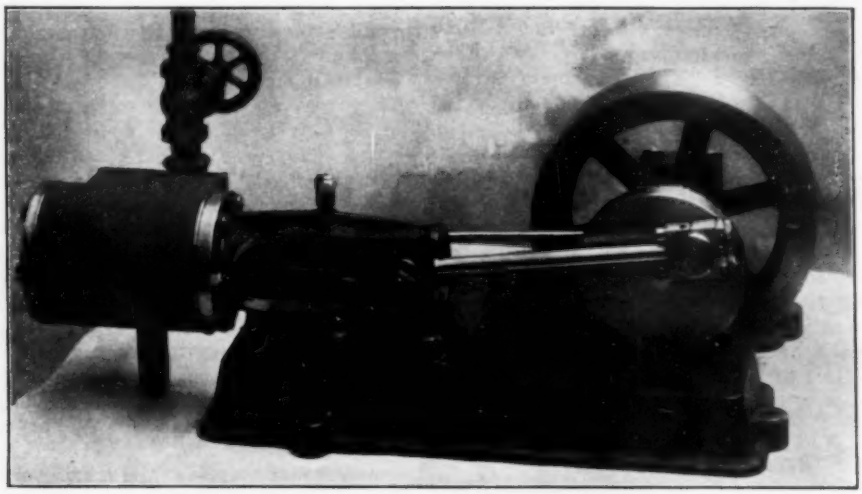
# How to Build a Small Steam Engine

## It Will Perform a Hundred Useful Tasks, and You Can Have All the Parts Free by a Little Work for Popular Mechanics

A small steam engine about your workshop, house or barn can be made to do all kinds of useful work. One of about one horse power would be large enough. It will turn a lathe; it will drive a small dynamo for electric lighting or for operating electric fans; it will run pumping machinery for pumping water; with belts it could be made to run the sewing machine, turn the sausage grinder or churn the milk, and a person with ingenius ideas could find a hundred and one other useful things for it to do. Soon such a person would have everything about the place operated by machinery, and it would save a world of labor and valuable time. The dentist, jeweler and many others would find it of immense value in running the light but fine and delicate machinery daily required for many uses in their occupation. An engine of this kind is easily built, even by a person who knows little about mechanics. There is no use in going to the expense of buying it complete. Build it yourself. Popular Mechanics will tell you how. Besides being so much cheaper, the engine will be more interesting and you will value it more if you build it yourself. Of course, you will have to get the different parts some way, and usually even they are expensive; so to get around this Popular Mechanics has arranged it so that not even the parts will cost you anything in the way of money; that is, if you can spare a little time and don't mind doing a small amount of hustling. Just get twenty-five new yearly paid subscribers to Popular Mechanics and you will get all the parts. There are forty-two of these parts, and they are the very best, and the engine will be first class when built.

If you would rather have the parts all machined, finished and ready to put together when they reach you, this will cost you a little extra; but it is not likely that you will want this done, as you will probably prefer to do the work yourself.



This is the Engine After Castings Have Been Tooled and Assembled

### FOR YOUNG ENGINEERS.

A book that is of great service, especially to young engineers, is J. V. Rohan's "Young Engineers' Guide." It is a book of practical instruction on the subject of steam engineering, and is highly endorsed. It has 254 pages, illustrated. This work, leather bound, will be sent to any address in the United States for two new yearly paid subscribers to Popular Mechanics.

### HANDBOOK ON ENGINEERING.

Tulley's Handbook on Engineering is valuable to all connected with the use of steam or electricity. It embraces all the recent improvements and the practical care and management of dynamos, motors, boilers, engines, pumps, inspirators and injectors, refrigerating machinery, hydraulic elevators, air compressors and all branches of steam engineering. This book will be sent free, all charges prepaid, for five new yearly paid subscribers.

### WONDERFUL PROGRESS OF THE WORLD.

Based on the idea of Popular Mechanics, "written so you can understand it," a new book has made its appearance, and like Popular Mechanics is meeting with wonderful success from the light-seeking public inhabiting the former "technique-befogged" atmosphere. The book is called "Our Wonderful Progress," and that is exactly what it tells about. It deals with all the world, telling of the achievements of man and the works of nature. It treats of the world's industry, science and invention, peculiarities and noteworthy facts about different nations, the wonders of nature, and concludes with a chapter on "Things We All Should Know." The work is supervised by Trumbull White, well known in newspaper circles, and he has been assisted by some of the foremost scientists and most skilled specialists of the day. "Our Wonderful Progress" is an extremely handsome volume, profusely illustrated and containing 768 pages. This book, bound in fine cloth, with emblematic stamping in gold and colors, plain edges, will be given to any person for five new yearly subscribers to Popular Mechanics. The book will be sent the very day that your club is received.